6/3/2019

Chennai

From

Dr Dr. S. Shenbaga Lalitha,Assistant Professor

Bharath Institute of Higher Education and Research,

Chennai

To

The Dean

Sree Balaji Medical College

Bharath institute of Higher Education Research,

Chennai

Sub: -Permission to conduct value- added course: Health Education to prevent Diabetes Mellitus

Respected sir,

With reference to subject mentioned above, the department proposes to conduct a value-added course titled: Health Education to prevent Diabetes Mellitus on 6/17/2019 for a period of three weeks

We kindly solicit your kind permission to commence the program.

Warm Regards,

Course Coordinator

Shenbaga

Dr Dr. S. Shenbaga
Lalitha,Assistant Professor

Sree Balaji Medical College & Hospital,

Chennai - 600 044

VALUE ADDED COURSE –Health Education to prevent Diabetes Mellitus

COURSE CO-ORDINATOR DETAILS

Faculty Name: Dr Dr. S. Shenbaga Lalitha,Assistant Professor

Email ID: ShenbagaLalitha.s@bharathuniv.ac.in

Mobile number: 9994869160

Bharath Institute of Higher Education and Research
Sree Balaji Medical College & Hospital

SCHOOL OF ALLIED HEALTH SCIENCES

Certificate of Participation

This is to certify that ***Mr./Ms. Amal Althaf***

has attended two weeks Value added Course on ***Health Education to prevent*** conducted by ,

School of Allied Health Sciences

Dr. W.M.S. JOHNSON
Dean,
SBMCH

Sree Balaji Medical College & Hospital,

Chennai - 600 044

Date: 6/7/2019

CIRCULAR

Notification for Value added courses

The School of Allied Health Sciences is scheduled to offer a Value added Certificate Course on **"Health Education to prevent Diabetes Mellitus"** from6/17/2019 for a period of 3 weeks. Interested students can approach Dr Dr. S. Shenbaga Lalitha,Assistant Professor and Course Coordinator, School of Allied Health Sciences for registration and for further details on or before 6/12/2019

Eligibility- Students of School of Allied Health Sciences

DEAN

Copy to:

Vice Chancellor

Pro Vice Chancellor

Additional Registrar

Deans

CoE

Heads of Departments

Health Education to prevent Diabetes Mellitus

Course Description

This fully online course is designed to help prepare health care professionals and educators support patients and their families in the management of diabetes. This value added course is designed to provide you with the tools you need to educate your patients. It can enhance your knowledge on all aspects of diabetes management including glycemic targets, lifestyle (nutrition and exercise) and pharmacological management, diabetic complications as well as adult education theory and chronic disease self-management principles that can enhance the education of all your patients with diabetes.

Learning Objectives

Upon successful competition of this certificate-level continuing education program, you will be better able to:

1. Discuss the pathophysiology, epidemiology and risk factors for the development of the different types of diabetes.

2. Review with a patient the diagnosis of pre-diabetes and diabetes, as well as glycemic targets and parameters requiring monitoring to reduce the risk of diabetic complications.

3. Educate a patient on the role of nutrition, physical activity and exercise in the prevention and management of diabetes

. 4. Counsel a patient on the different pharmacological treatment options through the course of living with diabetes.

5. Review strategies to prevent, screen and identify diabetic complications.

6. Use the self-management principles to enhance the diabetes education provided to patients and their families

. 7. Understand and tailor diabetes management and education provided to patients based on patient factors and their stage of life (ie. Child, adolescent, adult

8. Critically analyse current national and international guidelines relating to the prevention and management of diabetes, and apply these to different complex clinical situations.

Course Duration : 30 hours

Course coordinator : Professor /Associate professor – Department of Medicine

S.No	TOPICS	DURATION	FACULTY
1	Introduction to course	2 HOURS	Asst Prof : Dept of Medicine
2	Basic pathophysiology of diabetes	2 HOURS	Assoc Prof : : Dept of Medicine
3	Basic communication skills	2 HOURS	Asst Prof : Dept of Medicine
4	Management Concept and organizational Behaviour	2 HOURS	Assoc Prof : : Dept of Medicine
5	Health care over view	2 HOURS	Asst Prof : Dept of Medicine
6	Diabetes and its risks	2 HOURS	Asst Prof : Dept of Medicine
7	Business communication & correspondence	2 HOURS	Admin /Asst Prof : Dept of Medicine
8	Introduction to IT Based accounting and entrepreneurship	2 HOURS	IT department /Assoc Prof : : Dept of Medicine
9	Treatment of diabetes	2 HOURS	Assoc Prof : : Dept of Medicine
10	Management and care of Diabetes patient	2 HOURS	Asst Prof : Dept of Medicine
11	Diet counseling	2 HOURS	Assoc Prof : : Dept of Medicine
12	Complication awareness of	2 HOURS	Asst Prof : Dept of

	diabetes		Medicine
13	Case studies : workshop	2 HOURS	Assoc Prof : : Dept of Medicine
14	Assessment & counseling	2 HOURS	Asst Prof : Dept of medicine
15	ASSESSMENT	2 HOURS	Asst Prof : Dept of Medicine

Health Education to prevent Diabetes Mellitus

1	JENISHA ATHSAL R	U19AH02016
2	KANIMOZHI R	U19AH02017
3	GANGOTRI TIRKEY	U19AH01010
4	HARI PRASATH K	U19AH01011
5	IBIN K ISAC	U19AH01012
6	IGNESHYA P	U19AH01013
7	JASWANT B	U19AH01014
8	JENNIFER G	U19AH01015
9	ASWANI V S	U19AH01004
10	BERSHEBA JENCY P M	U19AH01005
11	CHACHU ABRAHAM	U19AH01006
12	DELICIA DABINA D	U19AH01007
13	DIVYA R	U19AH01008
14	DURGALAKSHMI R	U19AH01009
15	SUREKA U	U19AH01037
16	UMA MAGESHWARI M	U19AH01038
17	VASANTH T	U19AH01039
18	VIGNESH A	U19AH01040
19	ADITHYAN B L	U19AH02001
20	AKASH BIJU	U19AH02002
21	AKASH JAYAN	U19AH02003
22	ALWIN RAJ S	U19AH02004
23	ATHUL SABURAJ	U19AH02005
24	ABINAYA R	U19AH01002
25	ARULSELVI P	U19AH01003
26	VIGNESHWARI E	U19AH02031
27	ABISHA P A	U19AH03001
28	AKHILA REJI	U19AH03002
29	ALEENA SAJI	U19AH03003
30	KEERTHIKA P	U19AH03023
31	KOKILA S	U19AH03024
32	LOGA SRI S	U19AH03025
33	MAGESH M	U19AH03026
34	MATHUMITHA R	U19AH03027
35	NIRANJAN C	U19AH03028
36	NIVETHITHA K	U19AH03029
37	PAVITHRA N	U19AH03030
38	PRAVIN SHARMA R	U19AH03031
39	APARNA V	U19AH03008
40	BADARISHA KHARLYNGDOH	U19AH03009
41	BHARATH KUMAR S	U19AH03010
42	BHAVYA NAIR S	U19AH03011
43	DHILSHA RAVINDRAN	U19AH03012

44	FARZANE FATHIMA	U19AH03013
45	GOKUL KRISHNA T V	U19AH03014

6/7/2019

Chennai

From

Dr. D. Maheswary,Assistant Professor

Bharath Institute of Higher Education and Research,

Chennai

To

The Dean

Sree Balaji Medical College

Bharath institute of Higher Education Research,

Chennai

Sub: -Permission to conduct value- added course: Biohazard management

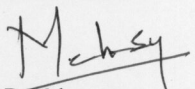
Respected sir,

With reference to subject mentioned above, the department proposes to conduct a value-added course titled: Biohazard management on 6/19/2019 for a period of three weeks

We kindly solicit your kind permission to commence the program.

Warm Regards,

Course Coordinator



Dr. D. Maheswary

Sree Balaji Medical College & Hospital,

Chennai - 600 044

VALUE ADDED COURSE –Biohazard management

COURSE CO-ORDINATOR DETAILS

Faculty Name: Dr. D. Maheswary,Assistant Professor

Email ID: Maheswary.d@bharathuniv.ac.in

Mobile number: 9791633196

Sree Balaji Medical College & Hospital,

Chennai - 600 044

Date: 6/11/2019

CIRCULAR

Notification for Value added courses

The School of Allied Health Sciences is scheduled to offer a Value added Certificate Course on **"Biohazard management"** from6/19/2019 for a period of 3 weeks. Interested students can approach Dr. D. Maheswary,Assistant Professor and Course Coordinator, School of Allied Health Sciences for registration and for further details on or before 6/14/2019

Eligibility- Students of School of Allied Health Sciences

DEAN

Copy to:

Vice Chancellor

Pro Vice Chancellor

Additional Registrar

Deans

CoE

Heads of Departments

Biohazard Waste Management Training Course

Syllabus Subject Category: Waste Management Course

Course Purpose: This course provides information to employees on LBNL procedures for proper management of medical waste.

Course Objectives: •

- To understand: Definition of medical waste, biohazardous waste, sharps waste, pathological waste.
- Regulatory framework for medical waste requirements.
- Proper procedures for accumulating medical waste in lab areas.
- Proper procedures for transferring waste and preparing waste for weekly disposal

COURSE OUTLINE & TOPICS

TOTAL DURATION: 30 HOURS

COURSE COORDINATOR : PROFESSOR/ASSOCIATE PROFESSOR DEPT. OF MICROBIOLOGY

S.No	TOPICS	DURATION	FACULTY
1	Introduction to course & Definitions Explanation on the "Act" means the Environment (Protection) Act, 1986 (29 of 1986);	2 HOURS	Asst Prof : Dept of Microbiology
2	Duties of the Occupier	2 HOURS	Assoc Prof : : Dept of Microbiology
3	Duties of the operator of a common bio-medical waste treatment and disposal facility	2 HOURS	Asst Prof : Dept of Microbiology
4	Duties of authorities.	2 HOURS	Assoc Prof : : Dept of Microbiology
5	Treatment and disposal	2 HOURS	Asst Prof : Dept of Microbiology

6	Segregation, packaging, transportation and storage.-	2 HOURS	Asst Prof : Dept of Microbiology
7	STANDARDS FOR AUTOCLAVING OF BIO-MEDICAL WASTE.-	2 HOURS	Asst Prof : Dept of Microbiology
8	STANDARDS OF MICROWAVING.	2 HOURS	Assoc Prof : : Dept of Microbiology
9	STANDARDS FOR DEEP BURIAL	2 HOURS	Assoc Prof : : Dept of Microbiology
10	Assignment	2 HOURS	Asst Prof : Dept of Microbiology
11	Visit to treatment plant	2 HOURS	Assoc Prof : : Dept of Microbiology
12	STANDARDS FOR EFFICACY OF CHEMICAL DISINFECTION	2 HOURS	Asst Prof : Dept of Microbiology
13	STANDARDS FOR DRY HEAT STERILIZATION	2 HOURS	Assoc Prof : : Dept of Microbiology
14	STANDARDS FOR LIQUID WASTE	2 HOURS	Asst Prof : Dept of Microbiology
15	ASSESSMENT	2 HOURS	Asst Prof : Dept of Microbiology

Bharath Institute of Higher Education and Research
Sree Balaji Medical College & Hospital

SCHOOL OF ALLIED HEALTH SCIENCES

Certificate of Participation

This is to certify that ***Mr./Ms. Thanga Vijay C***

has attended two weeks Value added Course on ***Biohazard management*** conducted by ,

School of Allied Health Sciences

Dr. W.M.S. JOHNSON
Dean,
SBMCH

Biohazard management		
1	ADITHYAN B L	U19AH02001
2	AKASH BIJU	U19AH02002
3	AKASH JAYAN	U19AH02003
4	ALWIN RAJ S	U19AH02004
5	ATHUL SABURAJ	U19AH02005
6	ABINAYA R	U19AH01002
7	ARULSELVI P	U19AH01003
8	VIGNESHWARI E	U19AH02031
9	ABISHA P A	U19AH03001
10	AKHILA REJI	U19AH03002
11	ALEENA SAJI	U19AH03003
12	KEERTHIKA P	U19AH03023
13	KOKILA S	U19AH03024
14	LOGA SRI S	U19AH03025
15	MAGESH M	U19AH03026
16	MATHUMITHA R	U19AH03027
17	APARNA V	U19AH03008
18	BADARISHA KHARLYNGDOH	U19AH03009
19	BHARATH KUMAR S	U19AH03010
20	BHAVYA NAIR S	U19AH03011
21	DHILSHA RAVINDRAN	U19AH03012
22	FARZANE FATHIMA	U19AH03013
23	GOKUL KRISHNA T V	U19AH03014
24	AKASH BIJU	U19AH02002
25	AKASH JAYAN	U19AH02003
26	ALWIN RAJ S	U19AH02004
27	ATHUL SABURAJ	U19AH02005
28	ABINAYA R	U19AH01002
29	ARULSELVI P	U19AH01003
30	VIGNESHWARI E	U19AH02031
31	ABISHA P A	U19AH03001
32	AKHILA REJI	U19AH03002
33	ALEENA SAJI	U19AH03003
34	KEERTHIKA P	U19AH03023
35	KOKILA S	U19AH03024
36	LOGA SRI S	U19AH03025
37	MAGESH M	U19AH03026
38	MATHUMITHA R	U19AH03027
39	NIRANJAN C	U19AH03028
40	ROSEMOL ANTONY	U19AH03035
41	SAMEER AHAMED M	U19AH03036
42	SAMIKSHAA RANJEEB	U19AH03037
43	SANTHOSH K	U19AH03038

44	SARAVANA KUMAR E	U19AH03039
45	VIJAYALAKSHMI Y G	U19AH03040
46	VINOTH KUMAR K	U19AH03041
47	NAMBI ARASU R	U19AH04001
48	AKASH A	U19AH05001
49	DHILSHA RAVINDRAN	U19AH03012
50	FARZANE FATHIMA	U19AH03013
51	GOKUL KRISHNA T V	U19AH03014
52	GOKUL KRISHNAN A	U19AH03015
53	HARIHARAN N	U19AH03016
54	HEMAKRISHNA E	U19AH03017
55	INDHUMATHI D	U19AH03018
56	JOEL JOHNSON	U19AH03019
57	JOTHILINGAM M	U19AH03020
58	KARTHICK A	U19AH03021
59	KARTHIKA B S	U19AH03022
60	KEERTHIKA P	U19AH03023
61	KOKILA S	U19AH03024

6/28/2019

Chennai

From

Dr Sumathy ,Associate Professor

Bharath Institute of Higher Education and Research,

Chennai

To

The Dean

Sree Balaji Medical College

Bharath institute of Higher Education Research,

Chennai

Sub: -Permission to conduct value- added course: Artificial Intelligence

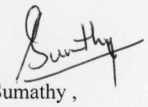
Respected sir,

With reference to subject mentioned above, the department proposes to conduct a value-added course titled: Artificial Intelligence on 7/12/2019 for a period of three weeks

We kindly solicit your kind permission to commence the program.

Warm Regards,

Course Coordinator



Dr Sumathy ,

Sree Balaji Medical College & Hospital,

Chennai - 600 044

VALUE ADDED COURSE –Artificial Intelligence

COURSE CO-ORDINATOR DETAILS

Faculty Name: Dr Sumathy ,Associate Professor

Email ID: sumathi.k@bharathuniv.ac.in

Mobile number: 9884222875

Sree Balaji Medical College & Hospital,

Chennai - 600 044

Date: 7/2/2019

CIRCULAR

Notification for Value added courses

The School of Allied Health Sciences is scheduled to offer a Value added Certificate Course on **"Artificial Intelligence"** from7/12/2019 for a period of 3 weeks. Interested students can approach Dr Sumathy ,Associate Professor and Course Coordinator, School of Allied Health Sciences for registration and for further details on or before 7/8/2019

Eligibility- Students of School of Allied Health Sciences

DEAN

Copy to:

Vice Chancellor

Pro Vice Chancellor

Additional Registrar

Deans

CoE

Heads of Departments

Bharath Institute of Higher Education and Research
Sree Balaji Medical College & Hospital

SCHOOL OF ALLIED HEALTH SCIENCES

Certificate of Participation

This is to certify that ***Mr./Ms. Syed Abul Hassan T S***

has attended two weeks Value added Course on ***Artificial Intelligence*** conducted by,

School of Allied Health Sciences

Dr. W.M.S. JOHNSON
Dean,
SBMCH

Name of the Course: Artificial Intelligence in Healthcare

Hours: 30 hrs

Syllabus

Topic	Faculty	Hours allotted
Artificial Intelligence – Introduction AI and healthcare	Dr Krishnaveni Sharath	2
Classification of the applications of Artificial Intelligence in Medicine and Health Care.	Dr Krishnaveni Sharath	1
Current application of AI in OPD and clinic	Dr Durga Devi	2
Telemedicine and use of AI	Dr Durga Devi	1
Electronic Health records & use of Artificial Intelligence	Dr Krishnaveni Sharath	2
Inbound patient care – Can AI help?	Dr V Padma	2
Lifestyle modifications – How to use AI	Dr Rahe R	2
Surigical cobots	Dr Vighneshwara Badikillaya	2
Assignment	Dr Rahe R	1
AI for health screening Use in community set up	Dr Umadevi	1
Use of AI in radiology & Pathology	Dr Impana BD	2
Use of AI in Cardiology and Neurology	Dr V Padma	3
Genetics & Genetic engineering – A new dimension by AI	Dr Krishnaveni Sharath	1
Use of AI in other specialities	Dr Sasikumar	2
Advantages & disadvantages of AI in healthcare	Dr Krishnaveni Sharath	1
Assignment	Dr Durga Devi	1
Rural healthcare & AI	Dr Umadevi	2
Ethics in using AI	Dr Rahe R	1
Assesment	Dr Krishnaveni Sharath	1

Artificial Intelligence

1	RANJIT N	U19AH03033
2	RANJITHA P	U19AH01027
3	ROSHINI PRIYA G	U19AH01028
4	RUBINI S	U19AH01029
5	SAHANA M	U19AH01030
6	SANTHOSH R	U19AH01031
7	SARANYA S	U19AH01032
8	SHARAN YUVARAJ S	U19AH01033
9	SINDIYA ARPUTHA KUMARI S	U19AH01034
10	SREE VARSHINI V	U19AH01035
11	SUDHARSANAVEL P A	U19AH01036
12	SUREKA U	U19AH01037
13	UMA MAGESHWARI M	U19AH01038
14	VASANTH T	U19AH01039
15	VIGNESH A	U19AH01040
16	ADITHYAN B L	U19AH02001
17	AKASH BIJU	U19AH02002
18	AKASH JAYAN	U19AH02003
19	ALWIN RAJ S	U19AH02004
20	ATHUL SABURAJ	U19AH02005
21	ABINAYA R	U19AH01002
22	ARULSELVI P	U19AH01003
23	VIGNESHWARI E	U19AH02031
24	ABISHA P A	U19AH03001
25	AKHILA REJI	U19AH03002
26	ALEENA SAJI	U19AH03003
27	KEERTHIKA P	U19AH03023
28	KOKILA S	U19AH03024
29	LOGA SRI S	U19AH03025
30	MAGESH M	U19AH03026
31	MATHUMITHA R	U19AH03027
32	NIRANJAN C	U19AH03028
33	NIVETHITHA K	U19AH03029
34	PAVITHRA N	U19AH03030
35	PRAVIN SHARMA R	U19AH03031

7/4/2019

Chennai

From

Dr. A. Mary Chandrika, Assistant Professor

Bharath Institute of Higher Education and Research,

Chennai

To

The Dean

Sree Balaji Medical College

Bharath institute of Higher Education Research,

Chennai

Sub: -Permission to conduct value- added course: Beginner to Pro in Power point

Respected sir,

With reference to subject mentioned above, the department proposes to conduct a value-added course titled: Beginner to Pro in Power point on 7/18/2019 for a period of three weeks

We kindly solicit your kind permission to commence the program.

Warm Regards,

Course Coordinator

Dr. A. Mary Chandrika

Sree Balaji Medical College & Hospital,

Chennai - 600 044

VALUE ADDED COURSE –Beginner to Pro in Power point

COURSE CO-ORDINATOR DETAILS

Faculty Name: Dr. A. Mary Chandrika,Assistant Professor

Email ID: MaryChandrika.a@bharathuniv.ac.in

Mobile number: 9962916777

Sree Balaji Medical College & Hospital,

Chennai - 600 044

Date: 7/8/2019

CIRCULAR

Notification for Value added courses

The School of Allied Health Sciences is scheduled to offer a Value added Certificate Course on **"Beginner to Pro in Power point"** from7/18/2019 for a period of 3 weeks. Interested students can approach Dr. A. Mary Chandrika,Assistant Professor and Course Coordinator, School of Allied Health Sciences for registration and for further details on or before 7/15/2019

Eligibility- Students of School of Allied Health Sciences

DEAN

Copy to:

Vice Chancellor

Pro Vice Chancellor

Additional Registrar

Deans

CoE

Heads of Departments

Bharath Institute of Higher Education and Research
Sree Balaji Medical College & Hospital

SCHOOL OF ALLIED HEALTH SCIENCES

Certificate of Participation

This is to certify that ***Mr./Ms. Jerin Mary Sam***

has attended two weeks Value added Course on ***Beginner to Pro in Power point*** conducted by,

School of Allied Health Sciences

Dr. W.M.S. JOHNSON
Dean,
SBMCH

Beginner to Pro in Power point

1	GOKUL KRISHNAN A	U19AH03015
2	HARIHARAN N	U19AH03016
3	HEMAKRISHNA E	U19AH03017
4	JASWANT B	U19AH01014
5	JENNIFER G	U19AH01015
6	ASWANI V S	U19AH01004
7	BERSHEBA JENCY P M	U19AH01005
8	CHACHU ABRAHAM	U19AH01006
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10	DIVYA R	U19AH01008
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13	UMA MAGESHWARI M	U19AH01038
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17	AKASH BIJU	U19AH02002
18	AKASH JAYAN	U19AH02003
19	ALWIN RAJ S	U19AH02004
20	ATHUL SABURAJ	U19AH02005
21	ABINAYA R	U19AH01002
22	ARULSELVI P	U19AH01003
23	VIGNESHWARI E	U19AH02031
24	DHINESH KUMAR D	U19AH02010
25	DIVYA BHARATHI N	U19AH02011
26	GAYATHRI V	U19AH02012
27	GEETANJALI CHADDHA	U19AH02013
28	HEMAVATHI M	U19AH02014
29	JENIFER W	U19AH02015
30	JENISHA ATHSAL R	U19AH02016
31	KANIMOZHI R	U19AH02017
32	GANGOTRI TIRKEY	U19AH01010
33	HARI PRASATH K	U19AH01011
34	IBIN K ISAC	U19AH01012
35	IGNESHYA P	U19AH01013
36	JASWANT B	U19AH01014
37	JENNIFER G	U19AH01015
38	ASWANI V S	U19AH01004
39	BERSHEBA JENCY P M	U19AH01005
40	CHACHU ABRAHAM	U19AH01006
41	DELICIA DABINA D	U19AH01007
42	DIVYA R	U19AH01008
43	DURGALAKSHMI R	U19AH01009

44	LOGAVARNOTHAMAN T V	U19AH01016
45	MAGESHWARAN A	U19AH01017
46	MAHESH S	U19AH01018
47	NANDHINI S	U19AH01019
48	NANTHINI M	U19AH01020
49	OM PRAKASH G	U19AH01021
50	PRADEEP S	U19AH01022
51	JENISHA ATHSAL R	U19AH02016
52	KANIMOZHI R	U19AH02017
53	GANGOTRI TIRKEY	U19AH01010
54	HARI PRASATH K	U19AH01011
55	IBIN K ISAC	U19AH01012
56	IGNESHYA P	U19AH01013
57	JASWANT B	U19AH01014
58	JENNIFER G	U19AH01015
59	ASWANI V S	U19AH01004
60	BERSHEBA JENCY P M	U19AH01005
61	CHACHU ABRAHAM	U19AH01006
62	DELICIA DABINA D	U19AH01007
63	DIVYA R	U19AH01008
64	DURGALAKSHMI R	U19AH01009
65	SUREKA U	U19AH01037
66	UMA MAGESHWARI M	U19AH01038
67	VASANTH T	U19AH01039
68	VIGNESH A	U19AH01040

7/6/2019

Chennai

From

Dr. K. Sharanya,Assistant Professor

Bharath Institute of Higher Education and Research,

Chennai

To

The Dean

Sree Balaji Medical College

Bharath institute of Higher Education Research,

Chennai

Sub: -Permission to conduct value- added course: Communication Skills in Tamil

Respected sir,

With reference to subject mentioned above, the department proposes to conduct a value-added course titled: Communication Skills in Tamil on 7/20/2019 for a period of three weeks

We kindly solicit your kind permission to commence the program.

Warm Regards,

Course Coordinator

Dr. K. Sharanya

Sree Balaji Medical College & Hospital,

Chennai - 600 044

VALUE ADDED COURSE –Communication Skills in Tamil

COURSE CO-ORDINATOR DETAILS

Faculty Name: Dr. K. Sharanya, Assistant Professor

Email ID: Sharanya.k@bharathuniv.ac.in

Mobile number: 9443166001

Sree Balaji Medical College & Hospital,

Chennai - 600 044

Date: 7/10/2019

CIRCULAR

Notification for Value added courses

The School of Allied Health Sciences is scheduled to offer a Value added Certificate Course on **"Communication Skills in Tamil"** from7/20/2019 for a period of 3 weeks. Interested students can approach Dr. K. Sharanya, Assistant Professor and Course Coordinator, School of Allied Health Sciences for registration and for further details on or before 7/15/2019

Eligibility- Students of School of Allied Health Sciences

DEAN

Copy to:

Vice Chancellor

Pro Vice Chancellor

Additional Registrar

Deans

CoE

Heads of Departments

Bharath Institute of Higher Education and Research
Sree Balaji Medical College & Hospital

SCHOOL OF ALLIED HEALTH SCIENCES

Certificate of Participation

This is to certify that ***Mr./Ms. Dhanushya S***

has attended two weeks Value added Course on ***Communication Skills in Tamil*** conducted by ,

School of Allied Health Sciences

Dr. W.M.S. JOHNSON
Dean,
SBMCH

Sugitha MAM.

Communication Skills in Tamil		
1	LOGA SRI S	U19AH03025
2	MAGESH M	U19AH03026
3	MATHUMITHA R	U19AH03027
4	NIRANJAN C	U19AH03028
5	KANIMOZHI R	U19AH02017
6	GANGOTRI TIRKEY	U19AH01010
7	SARANYA S	U19AH01032
8	SHARAN YUVARAJ S	U19AH01033
9	SINDIYA ARPUTHA KUMARI S	U19AH01034
10	SREE VARSHINI V	U19AH01035
11	SUDHARSANAVEL P A	U19AH01036
12	SUREKA U	U19AH01037
13	UMA MAGESHWARI M	U19AH01038
14	VASANTH T	U19AH01039
15	VIGNESH A	U19AH01040
16	ADITHYAN B L	U19AH02001
17	AKASH BIJU	U19AH02002
18	AKASH JAYAN	U19AH02003
19	ALWIN RAJ S	U19AH02004
20	JENISHA ATHSAL R	U19AH02016
21	KANIMOZHI R	U19AH02017
22	GANGOTRI TIRKEY	U19AH01010
23	HARI PRASATH K	U19AH01011
24	IBIN K ISAC	U19AH01012
25	IGNESHYA P	U19AH01013
26	JASWANT B	U19AH01014
27	JENNIFER G	U19AH01015
28	ASWANI V S	U19AH01004
29	BERSHEBA JENCY P M	U19AH01005
30	CHACHU ABRAHAM	U19AH01006
31	DELICIA DABINA D	U19AH01007
32	DIVYA R	U19AH01008
33	DURGALAKSHMI R	U19AH01009
34	LOGAVARNOTHAMAN T V	U19AH01016
35	MAGESHWARAN A	U19AH01017
36	MAHESH S	U19AH01018
37	NANDHINI S	U19AH01019
38	NANTHINI M	U19AH01020
39	OM PRAKASH G	U19AH01021
40	KOKILA S	U19AH03024
41	LOGA SRI S	U19AH03025
42	MAGESH M	U19AH03026

43	MATHUMITHA R	U19AH03027
44	NIRANJAN C	U19AH03028
45	NIVETHITHA K	U19AH03029

8/2/2019

Chennai

From

Dr Rajam Krishna, Associate Professor

Bharath Institute of Higher Education and Research,

Chennai

To

The Dean

Sree Balaji Medical College

Bharath institute of Higher Education Research,

Chennai

Sub: -Permission to conduct value- added course: Personality Development

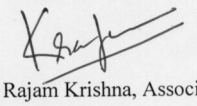
Respected sir,

With reference to subject mentioned above, the department proposes to conduct a value-added course titled: Personality Development on 8/16/2019 for a period of three weeks

We kindly solicit your kind permission to commence the program.

Warm Regards,

Course Coordinator



Dr Rajam Krishna, Associate Professor

Sree Balaji Medical College & Hospital,

Chennai - 600 044

VALUE ADDED COURSE –Personality Development

COURSE CO-ORDINATOR DETAILS

Faculty Name: Dr Rajam Krishna, Associate Professor

Email ID: devaki.pr@bharathuniv.ac.in

Mobile number: 9380031168

Sree Balaji Medical College & Hospital,

Chennai - 600 044

Date: 8/6/2019

CIRCULAR

Notification for Value added courses

The School of Allied Health Sciences is scheduled to offer a Value added Certificate Course on **"Personality Development"** from8/16/2019 for a period of 3 weeks. Interested students can approach Dr Rajam Krishna, Associate Professor and Course Coordinator, School of Allied Health Sciences for registration and for further details on or before 8/13/2019

Eligibility- Students of School of Allied Health Sciences

DEAN

Copy to:

Vice Chancellor

Pro Vice Chancellor

Additional Registrar

Deans

CoE

Heads of Departments

Bharath Institute of Higher Education and Research
Sree Balaji Medical College & Hospital

SCHOOL OF ALLIED HEALTH SCIENCES

Certificate of Participation

This is to certify that ***Mr./Ms. Lavanya Venu C***

has attended two weeks Value added Course on ***Personality Development*** conducted by,

School of Allied Health Sciences

Dr. W.M.S. JOHNSON
Dean,
SBMCH

PERSONALITY DEVELOPMENT COURSE

SL NO	TOPIC	METHODOLOGY OF TEACHING	TIME	FACULTY
1.	INTRODUCTION	Lecture	1 HOUR	Prof
2	SELF CONFIDENCE	Lecture	1 hour	AP
3	RAPPORT AND PEER GROUP INTERACTION	Powerpoint presentation	1 hour	SR
4	GROUP DYNAMICS	Lecture	2 hours	AP
5	GROUP DYNAMICS - ACTIVITY	Role play	1:30 hours	Prof
6	LEADERSHIP	Lecture	1 hour	Prof
7	LEADERSHIP STYLES	Power point presentation	1 HOUR	AP
8	INTERACTION WITH SUPERIORS AND SUBORDINATES	Lecture	1 hour	AP
9	EFFECTIVE COMMUNICATION	Role play	1 hour	Prof
10	PERFORMANCE ANXIETY	Lecture	1 hour	AP
11	DIPLOMACY	Lecture & skits	2 hours	Prof
12	ADVERSITY	Lecture & scenario discussion	1 hour	SR
13	BODY LANGUAGE	Lecture	1 hour	AP
14	ANGER/CONFLICT MANAGEMENT	Lecture	1 hour	AP
15	CONFLICT MANAGEMENT - ACTIVITY	Roleplay	2 HOURS	Prof
16	FAILURE MANAGEMENT	Lecture	2 hours	Prof
17	ASSESSMENT	MCQs	2 hours	AP
18	TARGETED WORKING PATTERN	Lecture and task	1 :30 hour	SR
19	HOW TO VALIDATE OUR POINT	Lecture	1 hour	Prof
20	CORRECTING OUR SHORTCOMINGS	Lecture	1 hour	AP
21	APPRECIATION AND PERKS	Lecture	1 hour	SR
22	MOTIVATION (SELF AND OTHERS)	Lecture & role play	2 hours	AP
23	IMPROMPTU ACTIVITY	Lecture & activity	2 hours	Prof
24	RATIONAL USE OF LANGUAGE	Lecture	1 hour1	AP
25	ETCHING YOURSELVES	Lecture	1 hour	Prof
26	ASSESSMENT	MCQs	2 hours	AP
27	TRANSFORMATION FROM UNASSERTIVE TO ASSERTIVE PERSONALITY	Lecture	1 HOUR	Prof
28	MODESTY AND GROWTH	Lecture	1 HOUR	Prof

Personality Development

1	AKHILA REJI	U19AH03002
2	ALEENA SAJI	U19AH03003
3	KEERTHIKA P	U19AH03023
4	KOKILA S	U19AH03024
5	LOGA SRI S	U19AH03025
6	MAGESH M	U19AH03026
7	MATHUMITHA R	U19AH03027
8	NIRANJAN C	U19AH03028
9	ABINAYA R	U19AH01001
10	BALAJI H	U19AH02006
11	BLESSON A	U19AH02007
12	CHANDRIKA B	U19AH02008
13	DEEPA V	U19AH02009
14	DHINESH KUMAR D	U19AH02010
15	DIVYA BHARATHI N	U19AH02011
16	GAYATHRI V	U19AH02012
17	GEETANJALI CHADDHA	U19AH02013
18	HEMAVATHI M	U19AH02014
19	JENIFER W	U19AH02015
20	JENISHA ATHSAL R	U19AH02016
21	KANIMOZHI R	U19AH02017
22	GANGOTRI TIRKEY	U19AH01010
23	SARANYA S	U19AH01032
24	SHARAN YUVARAJ S	U19AH01033
25	SINDIYA ARPUTHA KUMARI S	U19AH01034
26	SREE VARSHINI V	U19AH01035
27	SUDHARSANAVEL P A	U19AH01036
28	SUREKA U	U19AH01037
29	UMA MAGESHWARI M	U19AH01038
30	VASANTH T	U19AH01039
31	VIGNESH A	U19AH01040
32	ADITHYAN B L	U19AH02001
33	AKASH BIJU	U19AH02002
34	AKASH JAYAN	U19AH02003
35	ALWIN RAJ S	U19AH02004

4/24/2020

Chennai

From

Dr Rahe R , Assistant Professor

Bharath Institute of Higher Education and Research,

Chennai

To

The Dean

Sree Balaji Medical College

Bharath institute of Higher Education Research,

Chennai

Sub: -Permission to conduct value- added course: Fitness & Zumba

Respected sir,

With reference to subject mentioned above, the department proposes to conduct a value-added course titled: Fitness & Zumba on 5/6/2020 for a period of three weeks

We kindly solicit your kind permission to commence the program.

Warm Regards,

Course Coordinator

Dr Rahe R ,

Sree Balaji Medical College & Hospital,

Chennai - 600 044

VALUE ADDED COURSE –Fitness & Zumba

COURSE CO-ORDINATOR DETAILS

Faculty Name: Dr Rahe R , Assistant Professor

Email ID: Rahe.r@bharathuniv.ac.in

Mobile number: 9944072470

Bharath Institute of Higher Education and Research
Sree Balaji Medical College & Hospital

SCHOOL OF ALLIED HEALTH SCIENCES

Certificate of Participation

This is to certify that ***Mr./Ms. Pooja Prakash***

has attended two weeks Value added Course on ***Fitness & Zumba*** conducted by ,

School of Allied Health Sciences

Dr. W.M.S. JOHNSON
Dean,
SBMCH

Course Name: Zumba
Credit and Contact Hours: 1 credit hour – 2 contact hours
Catalog Description:
Zumba is a dance-fitness class that combines fast and slow rhythms from Latin and international music. The class adheres to a specific interval pacing formula, maximizing caloric output and body toning using easy steps and high energy music. No dance experience necessary.

I. Course Outcomes and Objectives:

Student Learning Outcomes:

The student will:

A. Improve their own cardiovascular system through aerobic exercise.
B. Identify ways to increase muscle strength, tone and flexibility.
C. Demonstrate a knowledge of interval training and resistance training.
D. Gain an understanding of the long term benefits of aerobic exercise.
E. Understand how to take and monitor heart rates while participating in an aerobic activity.
F. Understand the four basic rhythms through participation and their synthesis level through the demonstration of a basic routine.

Relationship To Academic Programs and Curriculum:

The course will fulfill one credit of the Physical Education requirements. Zumba will offer a high aerobic dance-fitness opportunity that emphasizes interval pacing, maximizing caloric output and body toning.

II. Instructional Materials and Methods:

Types of Course Materials:

Handouts

Methods of Instruction (e.g. Lecture, Labs, Seminars ...):

Lecture and Audio Visual Aids
Lab consisting of student participation, demonstration and observation

III. Assessment Measures (Summarize how the student learning outcomes will be assessed):

A. Attendance
B. Participation
C. Demonstration
D. Identification of each basic rhythm musically

Rubric based
Elements include: Attendance; Participation; Recognition of music style; Application of Movements; Quizzes and Semester project.

IV. General Outline of Topics Covered:

The importance of physical activity and lifestyle choices to promote wellness
Procedure to take both resting and target heart rates
Exercise safety protocol
Action plan for improving daily physical activity
Music and movement for the basic four (4) rhythms
The anatomy of a song
Physiology of exercise classes
Benefits of aerobic, muscular and interval training
The history and creative development of Zumba

Name of the Course: ZUMBA & FITNESS
Hours: 30 hrs
Syllabus

Topic	Faculty	Hours allotted
Definition of wellness & introduction to course	Trained Staff	1 hour
The importance of physical activity and lifestyle choices to promote wellness	Assistant Professor	2 hour
Procedure to take both resting and target heart rates		1 hour
Exercise safety protocol Action plan for improving daily physical activity		2 hour
Music and movement for the basic four (4) rhythms		1 hour
The		2 hour

anatomy of a song			
Assessment			2 hour
Practicals			2 hour
Physiology of exercise classes			2 hour
Benefits of aerobic, muscular and interval training			1 hour
The history and creative development of Zumba			1 hour
Practicals			2hours
Diet & fitness			2hours
Various Fitness strategies in health management			2hours
Assignment			1hour
Practicals			2 hour
Assessment			2 hour

Sree Balaji Medical College & Hospital,

Chennai - 600 044

Date: 4/28/2020

CIRCULAR

Notification for Value added courses

The School of Allied Health Sciences is scheduled to offer a Value added Certificate Course on **"Fitness & Zumba"** from5/6/2020 for a period of 3 weeks. Interested students can approach Dr Rahe R , Assistant Professor and Course Coordinator, School of Allied Health Sciences for registration and for further details on or before 5/1/2020

Eligibility- Students of School of Allied Health Sciences

DEAN

Copy to:

Vice Chancellor

Pro Vice Chancellor

Additional Registrar

Deans

CoE

Heads of Departments

Fitness & Zumba

1	SHABNAM KOUSER	U19AH06004
2	ABINA S	U19AH08001
3	GAYATHRI S	U19AH09001
4	HARSHA R	U19AH09002
5	KIRUTHIKA N P	U19AH02018
6	KIRUTHIKA S	U19AH02019
7	MOHAMED ASLAM J	U19AH02020
8	NAMITHA K	U19AH02021
9	PAVITHRA G	U19AH02022
10	PREETHI R	U19AH02023
11	SIDHIKA LAKSHMI D	U19AH02024
12	SOWMIYA K	U19AH02025
13	SUBHALAKSHMI K	U19AH02026
14	SURUTHI B	U19AH02027
15	SUVATHI R	U19AH02028
16	THIRUMAGAL M	U19AH02029
17	TOWFIQ HUSSAIN	U19AH02030
18	VIGNESHWARI E	U19AH02031
19	ABISHA P A	U19AH03001
20	AKHILA REJI	U19AH03002
21	ALEENA SAJI	U19AH03003
22	AMRITHA P	U19AH03004
23	ANAKHA A	U19AH03005
24	ANJALI S NAIR	U19AH03006
25	ANKITA SINGH	U19AH03007
26	APARNA V	U19AH03008
27	BADARISHA KHARLYNGDOH	U19AH03009
28	BHARATH KUMAR S	U19AH03010
29	BHAVYA NAIR S	U19AH03011
30	DHILSHA RAVINDRAN	U19AH03012
31	FARZANE FATHIMA	U19AH03013
32	GOKUL KRISHNA T V	U19AH03014
33	GOKUL KRISHNAN A	U19AH03015
34	HARIHARAN N	U19AH03016
35	HEMAKRISHNA E	U19AH03017
36	INDHUMATHI D	U19AH03018
37	JOEL JOHNSON	U19AH03019
38	JOTHILINGAM M	U19AH03020
39	KARTHICK A	U19AH03021
40	KARTHIKA B S	U19AH03022
41	KEERTHIKA P	U19AH03023
42	KOKILA S	U19AH03024
43	LOGA SRI S	U19AH03025

44	MAGESH M	U19AH03026
45	MATHUMITHA R	U19AH03027
46	NIRANJAN C	U19AH03028
47	NIVETHITHA K	U19AH03029
48	PAVITHRA N	U19AH03030
49	PRAVIN SHARMA R	U19AH03031
50	PRETTY MARY MATHEW	U19AH03032

4/28/2020

Chennai

From

Dr S Jayakumari, Assistant Professor

Bharath Institute of Higher Education and Research,

Chennai

To

The Dean

Sree Balaji Medical College

Bharath institute of Higher Education Research,

Chennai

Sub: -Permission to conduct value- added course: Entrepreneurial Opportunity & Entrepreneurial Planning

Respected sir,

With reference to subject mentioned above, the department proposes to conduct a value-added course titled: Entrepreneurial Opportunity & Entrepreneurial Planning on 5/12/2020 for a period of three weeks

We kindly solicit your kind permission to commence the program.

Warm Regards,

Course Coordinator

Dr S Jayakumari

Sree Balaji Medical College & Hospital,

Chennai - 600 044

VALUE ADDED COURSE –Entrepreneurial Opportunity & Entrepreneurial Planning

COURSE CO-ORDINATOR DETAILS

Faculty Name: Dr S Jayakumari, Assistant Professor

Email ID: jayakumari.s@bharathuniv.ac.in

Mobile number: 9444716937

Sree Balaji Medical College & Hospital,

Chennai - 600 044

Date: 5/2/2020

CIRCULAR

Notification for Value added courses

The School of Allied Health Sciences is scheduled to offer a Value added Certificate Course on **"Entrepreneurial Opportunity & Entrepreneurial Planning"** from5/12/2020 for a period of 3 weeks. Interested students can approach Dr S Jayakumari, Assistant Professor and Course Coordinator, School of Allied Health Sciences for registration and for further details on or before 5/7/2020

Eligibility- Students of School of Allied Health Sciences

DEAN

Copy to:

Vice Chancellor

Pro Vice Chancellor

Additional Registrar

Deans

CoE

Heads of Departments

Bharath Institute of Higher Education and Research
Sree Balaji Medical College & Hospital

SCHOOL OF ALLIED HEALTH SCIENCES

Certificate of Participation

This is to certify that ***Mr./Ms. Athira V R***

has attended two weeks Value added Course on ***Entrepreneurial Opportunity &*** conducted by ,

School of Allied Health Sciences

Dr. W.M.S. JOHNSON
Dean,
SBMCH

Entrepreneurial Opportunity & Entrepreneurial Planning

1	ABINAYA R	U19AH01001
2	BALAJI H	U19AH02006
3	BLESSON A	U19AH02007
4	CHANDRIKA B	U19AH02008
5	DEEPA V	U19AH02009
6	DHINESH KUMAR D	U19AH02010
7	DIVYA BHARATHI N	U19AH02011
8	GAYATHRI V	U19AH02012
9	GEETANJALI CHADDHA	U19AH02013
10	HEMAVATHI M	U19AH02014
11	JENIFER W	U19AH02015
12	JENISHA ATHSAL R	U19AH02016
13	KANIMOZHI R	U19AH02017
14	GANGOTRI TIRKEY	U19AH01010
15	HARI PRASATH K	U19AH01011
16	IBIN K ISAC	U19AH01012
17	IGNESHYA P	U19AH01013
18	JASWANT B	U19AH01014
19	JENNIFER G	U19AH01015
20	ASWANI V S	U19AH01004
21	BERSHEBA JENCY P M	U19AH01005
22	CHACHU ABRAHAM	U19AH01006
23	DELICIA DABINA D	U19AH01007
24	DIVYA R	U19AH01008
25	DURGALAKSHMI R	U19AH01009
26	LOGAVARNOTHAMAN T V	U19AH01016
27	MAGESHWARAN A	U19AH01017
28	MAHESH S	U19AH01018
29	NANDHINI S	U19AH01019
30	NANTHINI M	U19AH01020
31	OM PRAKASH G	U19AH01021
32	PRADEEP S	U19AH01022
33	PREETHI B	U19AH01023
34	PRINCY A	U19AH01024
35	RAJA RAJALAKSHMI R	U19AH01025
36	RANJITH R	U19AH01026
37	RIYA JOSEPH	U19AH03034
38	ROSEMOL ANTONY	U19AH03035
39	SAMEER AHAMED M	U19AH03036
40	SAMIKSHAA RANJEEB	U19AH03037
41	SANTHOSH K	U19AH03038
42	SARAVANA KUMAR E	U19AH03039
43	VIJAYALAKSHMI Y G	U19AH03040

44	VINOTH KUMAR K	U19AH03041
45	NAMBI ARASU R	U19AH04001
46	AKASH A	U19AH05001
47	BALAJI A V	U19AH05002
48	KARTHIK A	U19AH05003
49	MOLISH K	U19AH05004
50	SIVAPRAKASAM M M	U19AH05005
51	TANISHA P C	U19AH05006
52	INFANT AVINASH A	U19AH06001
53	ISHANI V	U19AH06002
54	RENUKA P	U19AH06003
55	MANIVANNAN K	U19AH09003
56	RENUKA D	U19AH09004
57	SANDHYA B	U19AH09005
58	SANTHOSH YADHAV P	U19AH09006
59	SHALINI K	U19AH09007
60	MADHAVI S	U19AH08002

Sri Lakshmi Narayana Institute of Medical Sciences

Date: 01.06.2019

From

Dr.G.Somasundram
Principal of Allied Health Sciences,
Sri Lakshmi Narayana Institute of Medical Sciences
Bharath Institute of Higher Education and Research,
Chennai.

To

The Dean,
Sri Lakshmi Narayana Institute of Medical College
Bharath Institute of Higher Education and Research,
Chennai.

Sub: Permission to conduct value-added course: Congestive Heart Failure and Pulmonary Edema

Dear Sir,

With reference to the subject mentioned above, the department proposes to conduct a value-added course titled: **Congestive Heart Failure and Pulmonary Edema** from July to September 2019. We solicit your kind permission for the same.

Kind Regards

Dr.G.Somasundram

FOR THE USE OF DEANS OFFICE

Names of Committee members for evaluating the course:

The Dean: **Dr. Jayalakshmi**

The HOD: **Dr. Somasundram. G**

The Expert: **Dr. Sangeetha**

The committee has discussed about the course and is approved.

Dean	Subject Expert	HOD
(Sign & Seal)	(Sign & Seal)	(Sign & Seal)

Dr. G. JAYALAKSHMI, BSC., MBBS., DTCD., M.D.,
DEAN
Sri Lakshmi Narayana Institute of Medical Sciences
Osudu, Agaram, Kudapakkam Post,
Villianur Commune, Puducherry - 605502.

PRINCIPAL
Allied Health Sciences
Sri Lakshmi Narayana Institute of Allied Health Sciences
Osudu, Agaram Post, Puducherry - 605 502.

OFFICE OF THE DEAN

Sri Lakshmi Narayana Institute of Medical Sciences

OSUDU, AGARAM VILLAGE, VILLIANUR COMMUNE, KUDAPAKKAM POST,
PUDUCHERRY - 605 502.
[Recognised by Medical Council of India, Ministry of Health letter No. U/12012/249/2005-ME (P -II) dt. 11/07/2011]
[Affliated to Bharath University, Chennai - TN]

Circular

30.06.2019

Sub: Organizing Value-added Course: "Congestive Heart Failure and Pulmonary Edema".reg

With reference to the above mentioned subject, it is to bring to your notice that Sri Lakshmi Narayana Institute of Medical Sciences, **Bharath Institute of Higher Education and Research** is organizing **"Congestive Heart Failure and Pulmonary Edema"**. The course content and registration form is enclosed below."

The application must reach the institution along with all the necessary documents as mentioned. The hard copy of the application should be sent to the institution by registered/ speed post only so as to reach on or before July to September 2019. Applications received after the mentioned date shall not be entertained under any circumstances.

Dean

Dr. G. JAYALAKSHMI, BSC., MBBS., DTCD., M.D.,
DEAN
Sri Lakshmi Narayana Institute of Medical Sciences
Osudu, Agaram, Kudapakkam Post,
Villianur Commune, Puducherry - 605502.

Encl: Copy of Course content

VALUE ADDED COURSE

1. Name of the programme & Code

"Congestive Heart Failure and Pulmonary Edema" & VAC01/AHS/2019-15/07

2. Duration & Period

30 hrs. & July to September 2019

3. Information Brochure and Course Content of Value Added Courses

Enclosed as Annexure- I

4. List of students enrolled

Enclosed as Annexure- II

5. Assessment procedures:

Assessment - *Enclosed as Annexure- III*

6. Certificate model

Enclosed as Annexure- IV

7. No. of times offered during the same year:

1 time July to September 2019

8. Year of discontinuation:

9. Summary report of each program year-wise

Value Added Course- July to September 2019					
Sl. No	**Course Code**	**Course Name**	**Resource Persons**	**Target Students**	**Strength & Year**
1	VAC01/AHS/2019-15/07	Congestive Heart Failure And Pulmonary Edema	Dr. Sangeetha	AHS	30 AHS students July to September 2019

10. Course Feed Back

Enclosed as Annexure- V

RESOURCE PERSON

COORDINATOR
Dr.G.Somasundram

PRINCIPAL
Allied Health Sciences
Sri Lakshmi Narayana Institute of Allied Health Sciences
Osudu, Agaram Post, Puducherry - 605 502.

Course Proposal

Course Title: "**Pulmonary Edema with Left Ventricular Failure"**

Course Objective:

1. To enhance the performance skill in Pulmonary Edema with Left Ventricular Failure.
2. To assess the reaction of target allied Health students in Pulmonary Edema with Left Ventricular Failure getting their feedback.

Course Outcome: Improvement in the "Pulmonary Edema with Left Ventricular Failure"
Course Audience: Students of AHS Batch
Course Coordinator: Dr.G.Somasundram
Course Faculties with Qualification and Designation:
1. Dr.Sangeetha
Course Curriculum/Topics with schedule (Min of 30 hours)

SlNo	Date	Topic	Time	Hours
1.	15.07.2019	Introduction to Pulmonary Edema with Left Ventricular Failure	4-6p.m	2
2.	17.07.2019	What is Pulmonary Edema	2-4p.m	2
3.	20.07.2019	What is Left Ventricular	4-6p.m	2
4.	22.07.2019	Cardiogenic and Non-Cardiogenic Pulmonary Edema	4-6p.m	2
5.	23.07.2019	Drugs used in Pulmonary Edema	4-6p.m	2
6.	25.07.2019	Complications of Pulmonary Edema	4-6p.m	2
7.	27.07.2019	Drugs used in Left Ventricular Failure	4-6P.M	2
8.	29.07.2019	Complications of Left Ventricular Failure	4-6p.m	2
9.	03.08.2019	Contraindication for drugs used in Left Ventricular Failure with Pulmonary Edema	4-6p.m	2
10.	05.08.2019	COPD	4-6p.m	2
11.	07.08.2019	Chronic Bronchitis	4-6p.m	2
12.	09.08.2019	Emphysema	4-6p.m	2
13.	10.08.2019	Pre course and Post Course evaluation, Feedback analysis	2-4p.m	2
14.	12.08.2019	Steps model explanation and various performance assessment	4-6p.m	2 m
15.	17.08.2019	Orientation of the students about the training program and assessment	2-4p.m	2
		Total		30 hrs

REFERENCE BOOKS:

1. Dorland's illustrated medical dictionary (32nd Ed.). Saunders/Elsevier. p. 593. ISBN 9781416062578.

2. Ware LB, Mathai MA (December 2005). "Clinical practice. Acute pulmonary edema". N. Engl. J. Med. 353 (26): 2788–96. Doi: 10.1056/NEJMcp052699. PMID 16382065.

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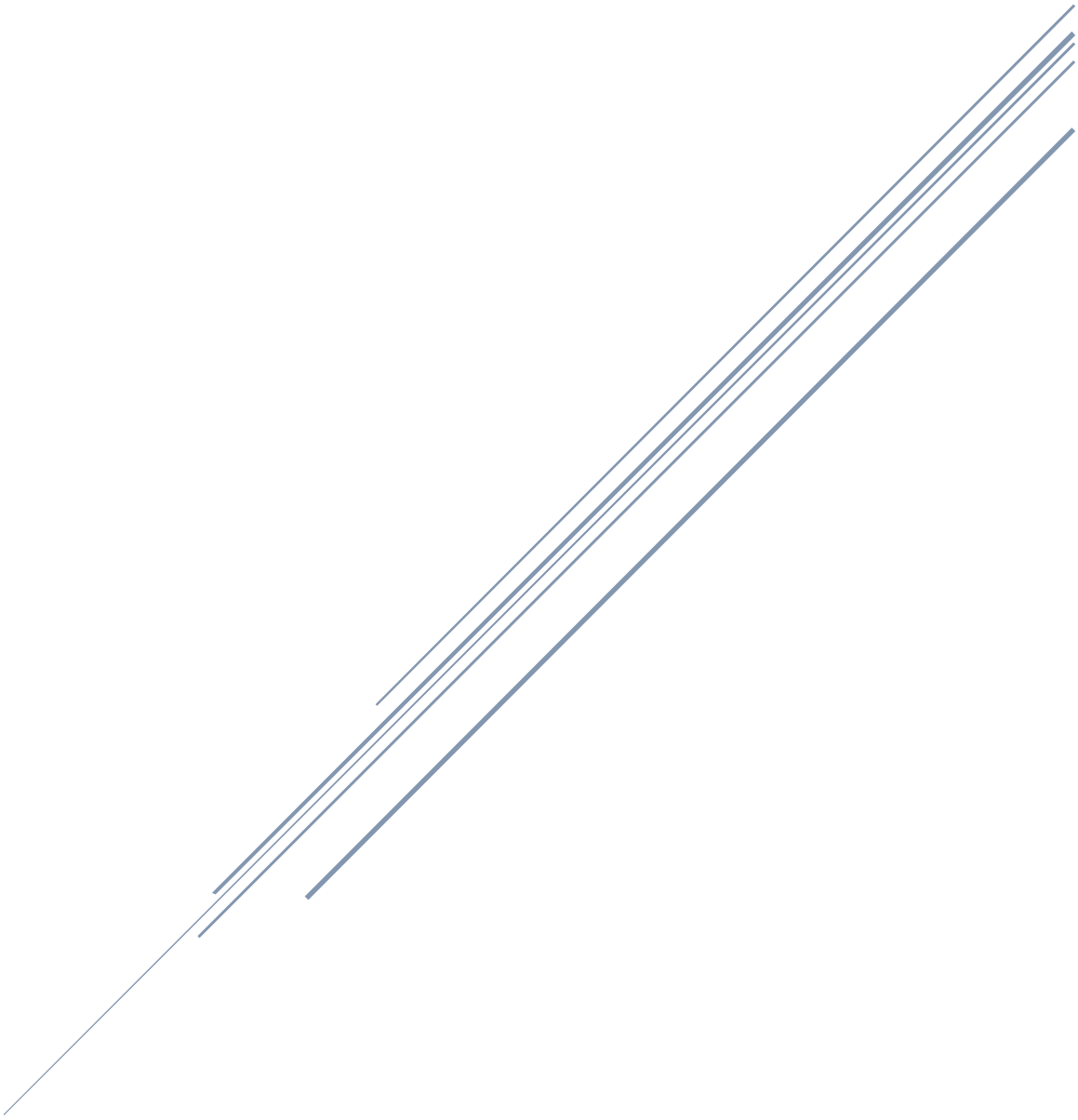
PULMONARY EDEMA WITH HEART FAILURE



CONTENT

Congestive Heart Failure and Pulmonary Edema

LV FAILURE

Introduction

The heart is comprised of the pericardium, myocardium, and endocardium. Pathology in any of those structures can lead to heart failure. Left ventricular failure occurs when there is dysfunction of the left ventricle causing insufficient delivery of blood to vital body organs. Left ventricular failure can further subdivide into heart failure with preserved ejection fraction (HFpEF with EF over 50%), heart failure with reduced ejection fraction (HFrEF with EF less than 40%), or heart failure with mid-range ejection fraction (EF between 41 and 49 percent).

Etiology

The most common etiologies of left heart failure are coronary artery disease and hypertension. The latter can cause left heart failure through left ventricular hypertrophy (leading to HFpEF), and also serves as a risk factor for coronary artery disease (which can lead to HFrEF). Diabetes, smoking, obesity, male gender, and a sedentary lifestyle are also considered risk factors. Many of these causes are preventable, and as such risk factor control remains of extreme importance in preventing heart failure.

Epidemiology

Heart failure is more prevalent and has a higher incidence in the elderly population. Approximately 5.7 million people in the United States have diagnosed heart failure. The incidence is around 10 per 1000 in people over 65. Approximately 50% of all patients with heart failure are considered to have HFrEF; this diagnosis is becoming more prevalent with time. HFpEF, as opposed to HFrEF, is more common in women (79% versus 49%) and also tends to affect an older population.

Pathophysiology

Multiple mechanisms can lead to left heart failure. Chronic or poorly controlled hypertension causes increased afterload and therefore increased cardiac workload, which can lead to hypertrophy of the left ventricle. Initially, this hypertrophy serves as a compensatory mechanism and can help maintain cardiac output, but long-term can inhibit relaxation of the myocardium leading to impaired cardiac filling and decrease left ventricular output. Coronary arterial disease causes direct ischemic damage to the myocardium, leading to remodeling and scar formation, which decreases contractility and cardiac output. Arrhythmias can cause remodeling, but in general, decrease cardiac output by impaired ventricular filling and decreased ventricular

relaxation. Cardiomyopathies encompass a diverse pathologic spectrum and have variable mechanisms causing cardiac dysfunction.

History and Physical

Patients with left heart failure may present with complaints of shortness of breath (often on exertion, a sensitivity of 89%), orthopnea (a specificity of 89%), paroxysmal nocturnal dyspnea and/or symptoms of volume overload (e.g., leg swelling, weight gain, increased abdominal girth, or right upper quadrant pain due to liver congestion). Interestingly, some patients with advanced disease might experience weight loss, referred to as "cardiac cachexia."

On physical exam, the most common signs encountered are:

- Rales on lung auscultation indicative of pulmonary edema
- Decreased breath sounds on lung auscultation suggestive of pleural effusion
- S3 gallop on heart auscultation indicative of elevated left ventricular end-diastolic pressure
- Point of maximal impulse displaced laterally on palpation characteristic of increased heart size
- Jugular venous distention (jugular venous pressure over 8 cm of water) indicative of elevated right atrial pressure
- Positive hepatojugular reflux (exerting manual pressure on the congested liver causing increased jugular venous pressures)
- Increased abdominal girth due to ascites
- Swelling of the scrotum
- Low blood pressure and rapid heart rate can occur in severely decompensated failure due to decreased cardiac output

Evaluation

The diagnosis of heart failure is clinical. However, several tests are available for further evaluation:

- Laboratory tests: brain natriuretic peptide (BNP) or NT-proBNP may be the most helpful as it can differentiate acute heart failure from other causes of shortness of breath. However, this test lacks specificity, and a high level of this hormone is not diagnostic of acute heart failure. Other laboratory tests include troponin T (to detect myocardial infarction, although the levels may be high due to heart failure itself), complete blood count, and basic metabolic panel (low sodium, in particular, indicates advanced disease) and liver function tests (to detect liver injury due to volume overload).

- Electrocardiography can show nonspecific findings, like ischemic changes, left ventricular hypertrophy, or arrhythmias.
- Echocardiography can help distinguish HFrEF from HFpEF by determining the ejection fraction, and diastolic left ventricular function can evaluate associated regional wall motion abnormalities that may be suggestive of an ischemic component, as well as valvular and pericardial pathologies.
- Coronary angiography is indicated in patients with anginal symptoms and may also be indicated in patients with worsening heart failure symptoms.

Treatment / Management

Patients should receive education on the importance of lifestyle modification for improving the outcome of their disease. This includes reasonable salt consumption and avoidance of alcohol, nicotine, and recreational drugs.

Treating the underlying cause is of extreme importance as some heart failure conditions may be reversible when the precipitating factors are addressed, like cardiomyopathies induced by alcohol, tachycardia or ischemia. Tight control of blood pressure will also help prevent further deterioration. Besides loop diuretics for volume overload, the pharmacologic treatment differs between HFrEF and HFpEF: -For HFrEF, the mainstay of treatment is the combination of an angiotensin-converting enzyme (ACE) inhibitors or angiotensin II receptor blockers (ARBs) with a beta blocker (carvedilol, metoprolol or bisoprolol). If the patient remains symptomatic on a maximal dose of ACE inhibitor or ARB, an angiotensin receptor-neprilysin inhibitor may be substituted. Other medications include hydralazine, nitrates, and mineralocorticoid receptor antagonists such as spironolactone, ivabradine, and digoxin (as a last resort). Nitrates in combination with hydralazine may be especially efficacious in African American patients. Digoxin, ivabradine and the diuretics have not been shown to offer any mortality benefit.

- For HFpEF, the treatment focuses on the underlying cause or contributing factors: control of blood pressure, revascularization if ischemic cardiomyopathy, and management of arrhythmias. A mineralocorticoid receptor antagonist may be beneficial in these patients.

Severely symptomatic patients with an ejection fraction less than 35% should obtain a referral for implantable cardioverter-defibrillator (ICD) or cardiac resynchronization therapy (CRT) (depending on QRS width and the type of intraventricular conduction delay) after medical optimization. In advanced cases, mechanical circulatory assist devices such as an LVAD, continuous infusion of inotropic medications such as dobutamine or milrinone (which is still possible in the ambulatory setting), and cardiac transplantation are options.

Differential Diagnosis

- When approaching a patient with shortness of breath on exertion, a broad differential diagnosis exists. A patient with established left heart failure might have a concomitant disease that might

contribute to the patient's presentation, and additional workup for other conditions is warranted in case of atypical presentations. Those conditions include other cardiovascular causes (like primary pulmonary hypertension), pulmonary causes (like chronic obstructive pulmonary disease and interstitial lung disease) and extra-cardiopulmonary causes (like anemia).

- Isolated lower limb edema is less likely heart failure, and other causes must be ruled out first, like venous insufficiency, cirrhosis, nephrotic syndrome, lymphedema and thrombosis of the veins.

Staging

The "2009 focused update incorporated into the ACC/AHA 2005 guidelines for the diagnosis and management of heart failure in adults" recommends a staging for heart failure. Patients with stages A and B are those who are asymptomatic but are prone to develop heart failure in the future, for example, diabetic and hypertensive patients. Stage B differs from stage A by the presence of a structural cardiac abnormality, like ventricular hypertrophy or systolic dysfunction, but again with no symptoms. Stage C and D patients include those who have ever experienced symptoms of heart failure. Stage D patients are those with severe heart failure who require advanced treatment like mechanical support, around-the-clock inotropic agents and heart transplantation.Stage C and D patients can be further classified based on the New York Heart Association (NYHA) Functional Classification:

- Class I: symptoms not restricting daily activities.
- Class II: symptoms occurring at moderate effort slightly restricting daily activities.
- Class III: symptoms occurring at minimal effort with significant restriction of daily activities.
- Class IV: debilitating symptoms are occurring at rest.

Prognosis

The mortality rate in heart failure in 2008 was 18.2 per 100,000 for males and 15.8 per 100,000 for females based on the "Morbidity and Mortality: 2012 Chart Book on Cardiovascular, Lung and Blood Diseases". Patients with HFpEF have been known to have a lower mortality rate than those with HFrEF.

Multiple variables have associations with worse outcome in heart failure: male gender, advancing age, low ejection fraction, high NYHA functional class, low hematocrit, and sodium levels, high brain natriuretic peptide, low peak exercise oxygen uptake, wide QRS, renal failure, low blood pressure, elevated heart rate, and volume overload refractory to medical treatment.

Complications

Left heart failure can be complicated with severe volume overload leading to respiratory distress and anasarca as well as arrhythmias (tachyarrhythmias or bradyarrhythmias), cardiogenic shock due to pump failure and death. It was also reported that pulmonary embolism, acute coronary syndrome, cerebrovascular accidents and rupture of the myocardium are common causes of sudden death in patients with heart failure. In addition to implantable cardioverter-defibrillators, several medications (stated above) reduce mortality in left heart failure and initiation of therapy should be as soon as indicated.

Deterrence and Patient Education

Compliance with lifestyle modification and pharmacologic treatment and control of precipitating factors (like hypertension and arrhythmias) are crucial to prevent hospitalizations for heart failure exacerbation and improve the quality of life. Many of those precipitating factors are potentially under patient control. That is why patient education is an integral part of a multidisciplinary approach to decrease mortality and morbidity due to heart failure.

Enhancing Healthcare Team Outcomes

An interprofessional approach is crucial in patients with advanced heart failure with an increased risk of readmissions. In a systematic review of 29 randomized controlled trials, an interprofessional approach decreased heart-failure related hospital admissions by 27% and all-cause mortality by around 25%. This approach was also cost-effective. Well-trained nurses are an integral part of this approach since heart failure clinics led by nurses and in coordination with the patients' providers were very successful in enhancing patient outcome. In addition to the availability of heart failure clinics, training personnel in heart failure management and patient education are cornerstones to a successful an interprofessional approach. Telephone follow up reduced hospital readmissions due to heart failure but not mortality.

Risk Factors and Etiology of Heart Failure

There are many causes of heart failure and the most common of which is coronary artery disease in the United States. The importance of identifying the risk factors for heart failure is that heart failure is preventable. In recognition of the preventable nature of the condition, the American College of Cardiology and the American Heart Association have modified their classification schemes so that patients currently without any structural abnormalities are identified early and treated appropriately. Treatment of systolic and diastolic hypertension concurrently in alignment with contemporary guidelines reduces the risk of heart failure by approximately 50%.

Risk Factors for Heart Failure

- Coronary artery disease (CAD)
- Connective tissue disorders (i.e., rheumatoid arthritis, scleroderma, systemic lupus erythematous)

- Endocrine disorders (i.e., diabetes mellitus, thyroid function disorders, growth hormone deficiency)
- Hypertension
- High-output conditions (i.e.: anemia, Paget disease)
- Valvular heart disease
- Metabolic causes (i.e., obesity)
- Myocarditis (i.e., secondary to HIV/AIDS, medications, or viruses)
- Infiltrative disorders (i.e., amyloidosis, sarcoidosis)
- Peripartum cardiomyopathy
- Stress cardiomyopathy (Takotsubo)
- Valvular heart disease
- Medications (i.e., amphetamines, anabolic steroids)
- Tachycardia induced cardiomyopathy
- Toxins (i.e., cocaine, alcohol)
- Nutritional deficiency (i.e., L-carnitine deficiency, thiamine)

Risk Factors and Etiology Acute Heart Failure (ADHF) / Flash Pulmonary Edema

Acute heart failure is the worsening of heart failure symptoms to the point that the patient requires intensification of therapy and intravenous treatment. Acute heart failure can be dramatic and rapid in onset, such as flash pulmonary edema or more gradual with the worsening of symptoms over time until a critical point of decompensation is reached. For those with a history of pre-existing heart failure, there is often a clear trigger for decompensation.

Potential Triggers of Acute Decompensated Heart Failure / Flash Pulmonary Edema

- Arrhythmia
- Acute coronary syndrome (CAD)
- Infection
- Worsening hypertension (i.e., hypertensive crisis)
- Medication non-adherence
- Acute renal artery stenosis
- Left ventricular diastolic dysfunction
- Obstructive sleep apnea
- Stress (Takotsubo) cardiomyopathy

Epidemiology

Heart Failure is a major public health problem and is now the most common cause of hospitalization in the US among patients 65 years and older, and approximately 915000 new cases of heart failure are diagnosed each year in the United States. The increasing prevalence of heart failure is most likely secondary to the aging of the population, increased risk factors, better outcomes for acute coronary syndrome survivors, and a reduction in mortality secondary to improved management of chronic conditions. Incidence rates for heart failure increase with age for both sexes.

The lifetime risk of developing heart failure for those over age 40 years residing in the U.S. is 20%. The risk and incidence of heart failure continue to increase from 20 per 1000 people age 60 to 65 years to over 80 per 1000 people over age 80. There are also differences in risk for heart failure based on the population, with African Americans having the highest risk and greater five-year mortality for heart failure than the white population in the U.S. The European Society of Cardiology states that the prevalence of heart failure is 1 to 2% and rises to greater than 10% in the over 70 population.

Heart Failure Statistics

- Heart Failure survival has improved over time, yet the absolute 5-year mortality rates from diagnosis for HF have remained at 50 percent.
- Heart failure is the number one diagnosis among all hospitalizations, and the cost of annual heart failure care exceeds $30 billion every year.
- Most of the cost spent on heart failure patients is for hospitalizations and re-admissions.

Acute Heart Failure

While consensus guidelines tend to use the term heart failure to refer to those with established chronic disease, acute heart failure is defined as a more rapid onset of signs and symptoms or the gradual worsening of chronic symptoms that necessitate intravenous treatment. Acute heart failure exacerbation that requires hospitalization tends to occur in the more elderly population mean age of 79 years old with a slightly higher preponderance of women affected than men. Data from the UK National Heart Failure Audit shows mortality rates of approximately 10% during the index admission, 30-day post-discharge mortality of 6.5% and 1-year mortality of 30%.

Pathophysiology

Different cardiovascular or metabolic abnormalities can cause heart failure, but in most patients, the clinical symptoms are secondary to left ventricular dysfunction. In cases caused by left ventricular dysfunction, the ejection fraction may be preserved or compromised. The ejection fraction is important because most clinical trials select patients based on the percentage of ejection fraction and use the data on ejection fraction to help guide therapy. In contrast,

pulmonary edema associated with acute decompensated heart failure is secondary to dysregulation of pulmonary fluid homeostasis and the forces that balance fluid movement into the alveolar space

History and Physical

History

Heart failure is mainly a clinical diagnosis. It is essential to consider the following during the history and physical.

1. The presentation of heart failure may vary based on each patient. If the patient has a history of heart failure in the past, ask them if this is the same presentation as when they had previous episodes of heart failure or an acute decompensation.

2. Consider non-cardiac and other causes for the patient's symptoms. It is important to ensure that there is a broad differential diagnosis and to avoid anchoring bias, premature closer, and diagnostic inertia.

3. Heart failure symptoms:

- Increasing dyspnea (on exertion, on lying flat or at rest, exercise intolerance)
- Increasing leg swelling, ascites, edema
- Increased body weight -ask patients if they have been tracking their weight at home and if it has increased since their symptoms have become worse.
- What are the patient's baseline symptoms, and are the current symptoms worse or similar to when they had previous heart failure exacerbations?
- Palpitations, automatic implantable cardioverter-defibrillator (*AICD*) shocks (associated with worse prognosis)
- Chest pain, fatigue
- Duration of Illness, recent or frequent hospitalizations for heart failure
- Medications or diet changes
- Anorexia, cachexia, or early satiety (associated with worse prognosis)
- Symptoms of transient ischemic attack (TIA) or thromboembolism (indicate a possible need for anticoagulation)
- Social history and family history (to assess for possible familial cardiomyopathy, alcohol or other cause
- Travel history (exposure risk some tropical diseases)

Physical Examination

The physical examination should include the following:

- Vital signs - assess blood pressure, heart rate, temperature, oxygen saturation, and respiratory rate. Vital signs are important in helping develop and refine the differential diagnosis and help the healthcare provider to better tailor the physical examination.
- Check patient weight – The patient's weight and BMI should be checked during each office visit. The information can be used to track response to treatment and the potential progression of heart failure or ADHF. Losing weight can also be a warning sign of worsening HF.
- Assessment of jugulovenous distension – Jugulovenous distension can be a marker for fluid overload. The patient should be lying at a 45-degree angle in bed to get an accurate assessment.
- Pulse - Assess the regularity and strength of the pulse
- Cardiac Examination
    - Extra heart sounds (i.e., S3 is associated with a worse prognosis), murmurs
    - Size and location of maximal cardiac impulse (can suggest ventricular enlargement if displaced)
    - Presence of right ventricular heave
- Pulmonary Examination - Respiratory rate, rhonchi, rales (note: pleural effusions can mask reduce breath sounds, and rhonchi or rales may be less prominent)
- Abdominal examination - check for ascites, hepatomegaly, hepatojugular reflux
- Lower extremity examination - assess for peripheral edema, the temperature of skin (cool lower extremities may be suggestive of worse cardiac output)

Evaluation

Classification of Heart Failure

Classification is one of the key determinates of how to evaluate and treat heart failure. When a patient is in acute or decompensated heart failure, our focus is on expeditious identification and treatment of life threats. When evaluating chronic heart failure, different classification schemes are available. The classification scheme used to categorize the type and degree of heart failure is based on the presentation and will affect the treatment and prognosis of the condition. Heart failure classification schemes are generally based on one of the following:

1. Anatomic findings (i.e., heart failure with different degrees of ejection fraction)
2. The chamber of the heart involved (including functional)
3. Symptoms of the patient

All heart failure patients should also be classified based on the ACCF/American Heart Association stages of heart failure, a New York Heart Association functional classification.[1]

ACCF/AHA Stages of Heart Failure

The ACC/AHA stages of heart failure are defined by the risk of heart failure, the presence of active heart failure, and whether structural heart disease is present. In general, the higher the classification, the greater the treatment and interventions that the patient may require.

- A - No structural heart disease present, high risk for heart failure, and asymptomatic
- B - Structural heart disease present, asymptomatic
- C - Structural heart disease present and current or previous symptoms of heart failure
- D - Heart failure that is refractory and requiring specialized interventions

NYHA Functional Classification of Heart Failure

The NYHA classification is a functional classification of heart failure and based upon how much the patients' symptoms limit their physical activity and to what degree physical activity can cause the person to become symptomatic. The grading scale is from me up to the most severe of grade IV where the patient is unable to carry on physical activity and has symptoms at rest.

Diagnostic Tests

Testing for heart failure patients should be focused on the patient's symptoms, clinical suspicion, and the current and any pre-existing or current stage of heart failure. The ordering of multiple routine tests should be avoided in all heart failure patients. Basic tests that should merit consideration for all patients evaluated for heart failure are the following:

- Serum electrolytes and kidney function
- Complete blood count
- Lipid level
- Liver function tests
- Troponin level - if there is concern that myocardial injury as the cause for symptoms
- Thyroid-stimulating hormone
- An electrocardiogram should also be performed in all heart failure patients

Other tests that may be considered based on severity and classification of patient condition are:

- Chest x-ray to assess for signs of pulmonary congestion or edema in acute decompensated heart failure
- Biomarkers - used to assess patients with more complex symptoms than acute heart failure (i.e., B-type natriuretic peptide and N-terminal pro-B-type natriuretic peptide)

For further information on the recommendations for evaluating heart failure, please see the American Heart Association and New York Heart Association classification based heart failure guidelines.

Treatment / Management

Treatment of Acute Decompensated Heart Failure and Pulmonary Edema

The focus of treatment for patients in heart failure is dependent on the severity of the symptoms and the stage of heart failure. When patients are in acute decompensated heart failure or flash pulmonary edema, the most important focus for therapeutic interventions is the enhancement of hemodynamic status through reduction of vascular congestion and improving preload, afterload, and myocardial contractility.

In flash pulmonary edema, where there is a rapid onset of heart failure, the initial management, and treatment goals are very similar to acute decompensated heart failure. Treatment options for acute decompensated heart failure and flash pulmonary edema are as follows:

1. ABC's - As with all patients, it is important to assess airway, breathing, and circulation in the initial evaluation and initiate appropriate management based on patient status. In decompensated heart failure, patients should be hooked up to cardiorespiratory monitoring, have IV access and oxygen administered if hypoxic or tachypnea, ECG performed, and have labs drawn based on clinical suspicion and patient condition.
2. Diuretics - most patients presenting in heart failure have a form of volume overload. AHA and ACC guidelines recommend intravenous (IV) loop diuretic administration to treat fluid overload. IV administration is preferred over oral for diuretics to maximize the bioavailability of the medication and clinical effect. Furosemide is a common treatment for acute decompensated heart failure and flash-pulmonary edema because of its anti-vasoconstrictor and diuretic effects.
3. Vasodilators - Patients with acute decompensated heart failure with HTN and acute pulmonary edema can benefit from treatment with vasodilators. Most vasodilators promote smooth muscle relaxation and vasodilatation to reduce preload and afterload through the cyclic guanine monophosphate pathway. Vasodilation relieves pulmonary vascular congestion and improves left ventricular preload and afterload. The common vasodilator medications used are Nitroglycerin and Sodium Nitroprusside.

    4.

    - Nitroglycerin can be given transdermal, sublingual, or intravenously depending on patient condition. In acute decompensation or flash pulmonary edema, nitroglycerin is best given sublingually or intravenously to allow for titration of effect.
    - Sodium Nitroprusside is only given intravenously. Patients with renal dysfunction treated with sodium Nitroprusside may need to have their cyanide levels monitored. Check with your pharmacist about guidelines for monitoring cyanide levels

5. Ionotrophic Medications - Additional treatment options for patients in cardiogenic shock or who have signs of end-organ dysfunction secondary to hypo perfusion. Inotropes should only be used as a treatment adjunct in acute decompensated

heart failure since data from the ADHERE registry suggest increased mortality with use. Dobutamine and MIlrinone are two inotropes that are more commonly used. Dobutamine is preferable for beta-blocker naive patients, while Milrinone is preferred for patients previously taking oral beta blockers who experience an acute decompensation.

6. CPAP/BIPAP - Continuous Positive Airway Pressure (CPAP) and Bilevel Positive Airway Pressure (BIPAP) are noninvasive methods of respiratory support to treat respiratory insufficiency secondary to pulmonary vascular congestion and pulmonary edema. The use of CPAP and BIBAP has reduced the need for intubation and mechanical ventilation in heart failure patients with acute respiratory decompensation. In situations where CPAP and BIPAP are ineffective in improving the patient's respiratory status, consider early intubation and mechanical ventilation to help prevent further decompensation and progression of symptoms.
7. Coronary revascularization - When performed in appropriately selected patients, revascularization can reduce mortality and morbidity by improving diastolic and systolic dysfunction. According to the American Heart Association 2013 CHF guidelines, coronary artery revascularization may be indicated as an intervention for heart failure patients with angina, LV dysfunction, and CAD. Interventional cardiology should be consulted early for patients according to AHA recommendations.
8. Admission to inpatient service for further treatment and evaluation. Patients being treated for flash pulmonary edema should be admitted to the hospital with the level of monitoring and care appropriate for each case. For select patients with acute decompensated heart failure, it may be possible to treat them at home depending on the severity of symptoms

The Medical Management of Heart Failure – Risk Factor Modification and Prevention of Acute Decompensation

While acute decompensated heart failure and flash pulmonary edema can be dramatic and require intensive care and aggressive therapy, the main focus of heart failure management is on helping prevent the progression of the disease and mitigate episodes of acute exacerbation. The American Heart Association and the New York Heart Association stages of heart failure are what medical practitioners often use to guide the evidence-based treatment of heart failure. Treatment of early stages of chronic heart failure usually focuses on risk factor modification, and as the disease process progresses, it starts to include more aggressive interventions.

- Risk factor modification
    1. Dietary and lifestyle changes, such as decreased salt intake, reducing obesity and smoking cessation
    2. Tighter control and management of hypertension, diabetes and dyslipidemia and other chronic diseases that can exacerbate CHF
- More aggressive intervention for those with a higher degree of CHF

1. Echocardiography for patients with a higher risk of left ventricular ejection fraction reduction
2. Implantable cardiac defibrillator placement when indicated in patients with ischemic cardiomyopathy at high risk of sudden death

For further information on the medical management of chronic heart failure, please refer to the American Heart Association and New York Heart Association guidelines.

Advanced Treatment Strategies for End-Stage Congestive Heart Failure

For select patients with end-stage heart failure, which are refractory to other treatment strategies, the option of mechanical circulatory support and cardiac transplantation should be considered. Mechanical circulatory support, as for example, a left ventricular assist device, is often used as a bridge therapy until a heart transplant is available. In certain situations, mechanical circulatory support is utilized as destination therapy.

For patients who are not candidates for mechanical circulatory support or cardiac transplantation, palliative care, and continuous inotropic support should be a consideration and discussed with the patient.

Differential Diagnosis

When patients present in acute decompensated heart failure or flash pulmonary edema, there are many different diagnoses to consider, based on the risk factors for heart failure alone. It is also important to consider other potentially life-threatening causes of heart failure.

1. Sepsis - Septic patients are at risk of multiorgan system failure. Approximately 1 out of 3 patients with sepsis present with reversible left ventricular systolic dysfunction, reduced ejection fracture, and 1 out of 2 patients with sepsis have left ventricular or right ventricular diastolic dysfunction. The cardiac dysfunction associated with sepsis can result in significantly increased mortality. Left ventricular diastolic dysfunction is associated with an increased mortality risk of 80%, and right ventricular diastolic dysfunction is associated with a 60% increased mortality
2. Acute respiratory distress syndrome (ARDS) is characterized by acute respiratory failure, and diffuse pulmonary infiltrates, which could potentially mimic flash pulmonary edema.
3. Neurological causes - Hemispheric and hippocampal brain infarcts are associated with heart failure and sudden cardiac death. Infarct of certain areas of the brain tissue can result in a sympathetic storm and loss of vasomotor homeostasis precipitated neurogenic pulmonary edema.
4. Pulmonary embolism - While a massive pulmonary embolism can cause acute cardiac dysfunction secondary to obstruction of blood flow, post pulmonary embolism syndrome may also present with heart failure type symptoms. Post pulmonary embolism syndrome, reduced exercise tolerance has been associated with reduced left ventricular ejection fraction, arrhythmia, valvular dysfunction, n and left ventricular diastolic dysfunction.

5. Acute coronary syndrome - Acute coronary syndrome or myocardial infarction is a common cause of acute decompensated heart failure.

Prognosis

The diagnosis of heart failure alone can be associated with a mortality rate greater than many cancers. Despite advances made in heart failure treatments, the prognosis of the condition worsens over time, resulting in frequent hospital admissions and premature death. One recent study showed that patients recently diagnosed with new-onset heart failure had a mortality rate of 20.2% at one year and 52.6% at five years. The one and five-year mortality rates also increase significantly based on patient age. Another study showed that the one and five-year mortality for patients at 60-year-old is 7.4%, and 24.4% and for patients at 80-year-olds is 19.5% and 54.4%. The mortality rates were similar when evaluated across different cardiac ejection fractions.

The prognosis is worse for heart failure patients who are hospitalized. Heart failure patients commonly require repeat hospitalizations and develop an intolerance for standard treatments as the disease progresses. Data from U.S. Medicare beneficiaries hospitalized during 2006 showed 30-day and 1-year mortality rates post admission of 10.8% and 30.7, % respectively. Mortality outcomes at one year also demonstrate a clear relationship with age and increase from 22% at 65 years old to 42.7% for patient's age 85 years and older.

Complications

Potential Complications of Heart Failure

- Worsening clinical status despite aggressive therapy
- Associated renal impairment and organ dysfunction which can compromise heart failure treatment efforts
- Recurrent hospitalizations for heart failure or most commonly associated co-morbidities, with resultant financial and personal cost to patients and families
- The progressive loss of ability to carry out activities of daily life
- Increased morbidity and mortality from the date of patient initial diagnosis with heart failure

Deterrence and Patient Education

Effective treatment of comorbidities and risk factor reduction can decrease the chance of developing heart failure. Patient education should be focused on ensuring compliance with prescribed evidence-based treatments.

- Hypertension - effective treatment of systolic and diastolic hypertension can reduce the risk of heart failure by approximately 50%
- Diabetes - is directly associated with the development of heart failure, independent of other associated clinical conditions
- Alcohol - heavy alcohol use is associated with heart failure
- Metabolic syndromes - important to keep up treatment based on evidence-based guidelines to decrease the risk of heart failure (i.e., lipid disorders)
- Patient education regarding dietary salt restriction and fluid restriction is imperative

Enhancing Healthcare Team Outcomes

The treatment of heart failure and acute decompensated heart failure is challenging despite the use of maximal evidence-based therapy based on the stage of heart failure. Given the limited effect that current treatment strategies have on the progression of heart failure, it is important to identify ways to maximize patient outcomes and quality of care by the interprofessional team.

Patients at potential risk for heart failure based on comorbidities or other identified risk factors should receive appropriate evidence-based preventative counseling and treatments. When appropriate, the primary care providers who may be the most involved in the management of the patients' risk factors should consult other specialists, including cardiologists, endocrinologists, pharmacists, cardiology nurses, and nutritionists, to ensure that they are providing the best advice and treatment for their patients. Nurses monitor patients, provide education, and collaborate with the physicians and the rest of the team to improve outcomes. Pharmacists review medications, inform patients and their families about side effects and monitor compliance.

Given the propensity of heart failure patients to require re-current admissions, often because of non-heart failure related conditions, the collaboration between inpatient and outpatient services can be of benefit in the continuity of care and helping promote improved outcomes.

PULMONARY EDEMA

Pulmonary edema is a condition caused by excess fluid in the lungs. This fluid collects in the numerous air sacs in the lungs, making it difficult to breathe.

In most cases, heart problems cause pulmonary edema. But fluid can collect in the lungs for other reasons, including pneumonia, exposure to certain toxins and medications, trauma to the chest wall, and traveling to or exercising at high elevations.

Pulmonary edema that develops suddenly (acute pulmonary edema) is a medical emergency requiring immediate care. Pulmonary edema can sometimes cause death. The outlook improves if you get treated quickly. Treatment for pulmonary edema varies depending on the cause but generally includes supplemental oxygen and medications.

Symptoms

Pulmonary edema signs and symptoms may appear suddenly or develop over time. The signs and symptoms you have depends on the type of pulmonary edema.

Sudden (acute) pulmonary edema signs and symptoms

- Difficulty breathing (dyspnea) or extreme shortness of breath that worsens with activity or when lying down
- A feeling of suffocating or drowning that worsens when lying down
- A cough that produces frothy sputum that may be tinged with blood
- Wheezing or gasping for breath
- Cold, clammy skin
- Anxiety, restlessness or a sense of apprehension
- Bluish lips
- A rapid, irregular heartbeat (palpitations)

Long-term (chronic) pulmonary edema signs and symptoms

- Difficulty breathing with activity or when lying flat
- Awakening at night with a cough or breathless feeling that may be relieved by sitting up
- More shortness of breath than normal when you're physically active

- Wheezing
- Rapid weight gain
- Swelling in your lower extremities
- Fatigue
- New or worsening cough

High-altitude pulmonary edema (HAPE) signs and symptoms

HAPE can occur in adults and children who travel to or exercise at high altitudes. Signs and symptoms are similar to those that occur with acute pulmonary edema and can include:

- Headache, which may be the first symptom
- Shortness of breath with activity, which worsens to shortness of breath at rest
- Decreased ability to exercise as you once could
- Dry cough, at first
- Later, a cough that produces frothy, pink sputum
- A very fast heartbeat (tachycardia)
- Weakness
- Chest pain
- Low-grade fever

Signs and symptoms of high-altitude pulmonary edema (HAPE) tend to get worse at night.

When to see a doctor

Pulmonary edema that comes on suddenly (acute pulmonary edema) is life-threatening. Call 911 or emergency medical help if you have any of the following acute signs and symptoms:

- Shortness of breath, especially if it comes on suddenly

- Trouble breathing or a feeling of suffocating (dyspnea)
- A bubbly, wheezing or gasping sound when you breathe
- Pink, frothy sputum when you cough
- Breathing difficulty along with a lot of sweating
- A blue or gray color to your skin
- Confusion
- A significant drop in blood pressure resulting in lightheadedness, dizziness, weakness or sweating
- A sudden worsening of any of pulmonary edema symptoms

Don't attempt to drive yourself to the hospital. Instead, call 911 or emergency medical care and wait for help.

Request an Appointment at Mayo Clinic

Causes

The causes of pulmonary edema vary. Pulmonary edema is grouped into two categories, depending on where the problem started.

- If a heart problem causes the pulmonary edema, it's called cardiogenic pulmonary edema. Most often, the fluid buildup in the lungs is due to a heart condition.
- If pulmonary edema is not heart related, it's called noncardiogenic pulmonary edema.
- Sometimes, pulmonary edema can be caused by both a heart problem and a non-heart problem.

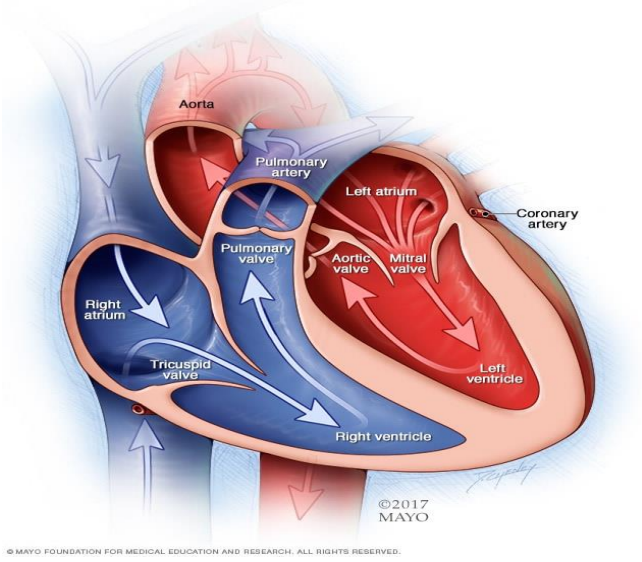
Understanding the relationship between your lungs and your heart can help explain why pulmonary edema may occur.

How your lungs work

Your lungs contain many small, elastic air sacs called alveoli. With each breath, these air sacs take in oxygen and release carbon dioxide. Normally, this exchange of gases occurs without problems.

But sometimes, the alveoli fill with fluid instead of air, preventing oxygen from being absorbed into your bloodstream.

How your heart works



Chambers and valves of the heart Open pop-up dialog box

Your heart is made of two upper and two lower chambers. The upper chambers (the right and left atria) receive incoming blood and pump it into the lower chambers (right and left ventricles). The lower chambers pump blood out of your heart.

Normally, deoxygenated blood from all over your body enters the right atrium then the right ventricle, where it's pumped through large blood vessels (pulmonary arteries) to your lungs. There, the blood releases carbon dioxide and picks up oxygen as it flows by the alveoli.

The oxygen-rich blood then returns to the left atrium through the pulmonary veins, flows through the mitral valve into the left ventricle and finally leaves your heart through the largest blood vessel in the body, called the aorta.

The heart valves keep blood flowing in the correct direction. The aortic valve keeps the blood from flowing backward into your heart. From the aorta, the blood travels to the rest of your body.

Heart-related (cardiogenic) pulmonary edema

Cardiogenic pulmonary edema is caused by increased pressures in the heart.

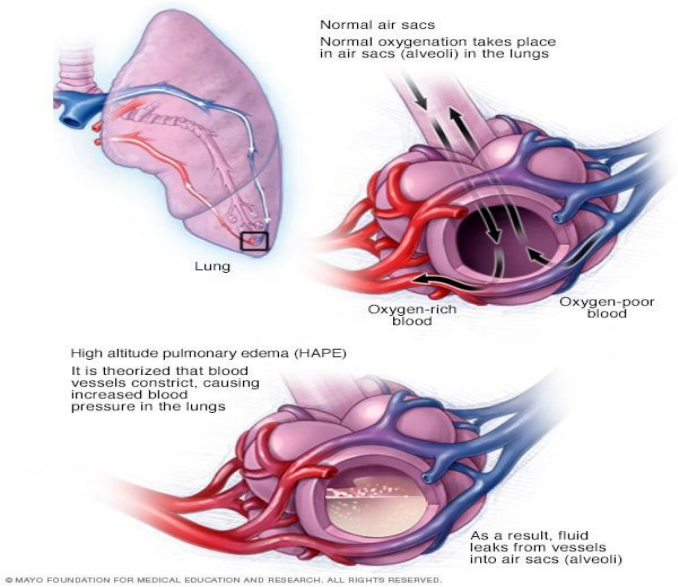
It's usually a result of heart failure. When a diseased or overworked left ventricle can't pump out enough of the blood it gets from your lungs, pressures in the heart go up. The increased pressure pushes fluid through the blood vessel walls into the air sacs.

Medical conditions that can cause heart failure and lead to pulmonary edema include:

- **Coronary artery disease.** Over time, the arteries that supply blood to your heart muscle can become narrow from fatty deposits (plaques). A slow narrowing of the coronary arteries can make the left ventricle weak. Sometimes, a blood clot forms in one of these narrowed arteries, blocking blood flow and damaging part of your heart muscle, resulting in a heart attack. A damaged heart muscle can no longer pump as well as it should.
- **Cardiomyopathy.** This term means heart muscle damage. If you have cardiomyopathy, your heart has to pump harder, and pressures go up. The heart may be unable to respond to conditions that require it to work harder, such as exercise, infection or a rise in blood pressure. When the left ventricle can't keep up with the demands that are placed on it, fluid backs up into your lungs.
- **Heart valve problems.** Narrowing of the aortic or mitral heart valves (stenosis) or a valve that leaks or doesn't close properly affects blood flow into the heart. The heart has to work harder, and pressures go up. If valve leakage develops suddenly, you may develop sudden and severe pulmonary edema.
- **High blood pressure (hypertension).** Untreated or uncontrolled high blood pressure can enlarge the heart.

- **Other heart problems.** Inflammation of the heart muscle (myocarditis), congenital heart defects and abnormal heart rhythms (arrhythmias) also may cause pulmonary edema.
- **Kidney disease.** High blood pressure due to narrowed kidney arteries (renal artery stenosis) or fluid buildup due to kidney disease can cause pulmonary edema.
- **Chronic health conditions.** Thyroid disease and a buildup of iron (hemochromatosis) or protein (amyloidosis) also may contribute to heart failure and cause pulmonary edema.

Non-heart-related (noncardiogenic) pulmonary edema



High-altitude pulmonary edema

Open pop-up dialog box

Pulmonary edema that is not caused by increased pressures in your heart is called noncardiogenic pulmonary edema.

Causes of noncardiogenic pulmonary edema include:

- **Acute respiratory distress syndrome (ARDS).** This serious disorder occurs when your lungs suddenly fill with fluid and inflammatory white blood cells. Many

conditions can cause ARDS, including severe injury (trauma), widespread infection (sepsis), pneumonia and severe bleeding.

- **Adverse drug reaction or drug overdose.** Many drugs — ranging from aspirin to illegal drugs such as heroin and cocaine — are known to cause pulmonary edema.
- **Blood clot in the lungs (pulmonary embolism).** If a blood clot travels from the blood vessels in your legs to your lungs, you can develop pulmonary edema.
- **Exposure to certain toxins.** Inhaling toxins or breathing in some of your stomach contents when you vomit (aspiration) causes intense irritation of the small airways and alveoli, resulting in fluid buildup.
- **High altitudes.** Pulmonary edema has been seen in mountain climbers, skiers, hikers and other people who travel to high elevations, usually above 8,000 feet (about 2,400 meters). High-altitude pulmonary edema (HAPE) generally occurs in those who don't first become acclimated to the elevation (which can take from a few days to a week or so). But people who live at high altitudes can get HAPE with no elevation change if they have a respiratory infection.
- **Near drowning.** Inhaling water causes fluid buildup in the lungs that is reversible with immediate medical care.
- **Negative pressure pulmonary edema.** Pulmonary edema can develop after a blockage in the upper airway causes negative pressure in the lungs from intense efforts to breathe despite the blockage. With treatment, most people with this type of pulmonary edema recover in about 24 hours.
- **Nervous system conditions or procedures.** A type of pulmonary edema called neurogenic pulmonary edema can occur after a head injury, seizure or brain surgery.
- **Smoke inhalation.** Smoke from a fire contains chemicals that damage the membrane between the air sacs and the capillaries, allowing fluid to enter your lungs.
- **Transfusion-related lung injury.** Blood transfusions may cause fluid overload in the left ventricle, leading to pulmonary edema.
- **Viral infections.** Pulmonary edema can be caused by viruses such as the Hantavirus and dengue virus.

Risk factors

Heart failure and other heart conditions that raise pressure in the heart increase the risk of pulmonary edema. Risk factors for heart failure include:

- Abnormal heart rhythms (arrhythmias)
- Alcohol use
- Congenital heart disease
- Coronary artery disease
- Diabetes
- Heart valve disease
- High blood pressure
- Sleep apnea

However, some nervous system conditions and lung damage due to near drowning, drug use, smoke inhalation, viral infections and blood clots also raise your risk.

People who travel to high-altitude locations above 8,000 feet (about 2,400 meters) are more likely to develop high-altitude pulmonary edema (HAPE). It usually affects those who do not first become acclimated to the elevation (which can take from a few days to a week or so).

Children who have existing pulmonary hypertension and structural heart defects may be more likely to get HAPE.

Complications

Complications depend on the underlying cause.

In general, if pulmonary edema continues, the pressure in the pulmonary artery can go up (pulmonary hypertension). Eventually, the heart becomes weak and begins to fail, and pressures in the heart and lungs go up.

Complications can include:

- Breathing difficulty
- Swelling of the legs, feet and abdomen
- Buildup of fluid in the membranes that surround your lungs (pleural effusion)
- Congestion and swelling of the liver

Immediate treatment is necessary for acute pulmonary edema to prevent death.

Prevention

You may be able to prevent pulmonary edema by managing existing heart or lung conditions and following a healthy lifestyle.

For example, you can reduce your risk of many kinds of heart problems by taking steps to control your cholesterol and blood pressure. Follow these tips to keep your heart healthy:

- Eat a healthy diet rich in fresh fruits, vegetables, whole grains, fat-free or low-fat dairy, and a variety of proteins.
- Manage your weight.
- Get regular exercise.
- Don't smoke.
- Limit salt and alcohol.
- Manage stress.

Preventing high-altitude pulmonary edema (HAPE)

To prevent HAPE, gradually ascend to high elevations. Although recommendations vary, most experts advise increasing elevation no more than 1,000 to 1,200 feet (about 300 to 360 meters) a day once you reach 8,200 feet (about 2,500 meters).

Some climbers take prescription medications such as acetazolamide or nifedipine (Adalat CC, Procardia) to help prevent signs and symptoms of HAPE. To prevent HAPE, start taking the medication at least one day before ascent. Ask your

doctor how long you need to take the medication after you've arrived at your high-altitude destination.

Diagnosis

Breathing problems require immediate diagnosis and treatment. Your doctor can make a preliminary diagnosis of pulmonary edema based on your signs and symptoms and the results of a physical exam, electrocardiogram and chest X-ray.

Once your condition is more stable, your doctor will ask questions about your medical history, especially whether you have ever had cardiovascular or lung disease.

Tests that may be done to diagnose pulmonary edema or to determine why you developed fluid in your lungs include:

- **Chest X-ray.** A chest X-ray can confirm the diagnosis of pulmonary edema and exclude other possible causes of your shortness of breath. It's usually the first test done when someone has signs or symptoms of pulmonary edema.
- **Chest CT.** A computed tomography (CT) scan of the chest may not provide the cause for the pulmonary edema, but can give your doctor indirect clues to help make a diagnosis.
- **Pulse oximeters.** A sensor is attached to your finger or ear and uses light to determine how much oxygen is in your blood.
- **Arterial blood gas test.** Blood is taken, usually from an artery in your wrist, and checked for the amount of oxygen and carbon dioxide it contains (arterial blood gas concentrations).
- **B-type natriuretic peptide (BNP) blood test.** Increased levels of BNP may signal a heart condition.
- **Other blood tests.** Blood tests to diagnose pulmonary edema and its causes also usually include a complete blood count, metabolic panel to check kidney function and thyroid function test.
- **Electrocardiogram (ECG or EKG).** This painless test detects and records the timing and strength of your heart's signals using small sensors (electrodes) attached to the skin on your chest and legs. The signals are recorded in the form of

waves on graph paper or a monitor. An ECG can show signs of heart wall thickening or previous heart attack. A portable ECG machine such as a Holter monitor may be used to continuously monitor your heartbeat at home.

- **Echocardiogram.** An echocardiogram creates a moving picture of your heart using sound waves (ultrasound). It can identify areas of poor blood flow, abnormal heart valves and heart muscle that is not working normally. Your doctor can use this test to help diagnose fluid around the heart (pericardial effusion).
- **Cardiac catheterization and coronary angiogram.** This test may be done if an ECG, echocardiogram or other tests don't show the cause of pulmonary edema, or if you also have chest pain.

  During cardiac catheterization, a doctor inserts a long, thin tube (catheter) in an artery or vein in your groin, neck or arm. X-rays help guide the catheter through the blood vessel to your heart. During a coronary angiogram, dye flows through the catheter, allowing blood vessels to show up more clearly on the X-rays. A coronary angiogram can reveal any blockages and measure the pressure in your heart chambers.
- **Ultrasound of the lungs.** This painless test uses sound waves to measure blood flow through the lungs. It can quickly reveal signs of fluid buildup and plural effusions. Lung ultrasound has become an accurate tool for diagnosing pulmonary edema.

More Information

- Cardiac catheterization
- Chest X-rays
- Echocardiogram

Treatment

The first treatment for acute pulmonary edema is supplemental oxygen. You usually receive oxygen through a face mask or nasal cannula — a flexible plastic tube with two openings that deliver oxygen to each nostril. This should ease some of your symptoms.

Your doctor will monitor your oxygen level closely. Sometimes it may be necessary to assist your breathing with a machine such as a mechanical ventilator or one that provides positive airway pressure.

Depending on the severity of your condition and the reason for your pulmonary edema, you may also receive one or more of the following medications:

- **Diuretics.** Doctors commonly prescribe diuretics, such as furosemide (Lasix), to decrease the pressure caused by excess fluid in your heart and lungs.
- **Morphine (MS Contin, Oramorph, others).** This narcotic may be taken by mouth or given through an IV to relieve shortness of breath and anxiety. But some doctors believe that the risks of morphine may outweigh the benefits and are more likely to use other drugs.
- **Blood pressure drugs.** If you have high or low blood pressure when you develop pulmonary edema, you'll be given medications to help manage the condition. Your doctor may also prescribe medications that lower the pressure going into or out of your heart. Examples of such medicines are nitroglycerin (Nitromist, Nitrostat, others) and nitroprusside (Nitropress).
- **Inotropes.** This type of medication is given through an IV if you are in the hospital with severe heart failure. Inotropes improve heart pumping function and maintain blood pressure.

It is important to diagnosis and treat, if possible, any nervous system problems or causes of heart failure.

Treating high-altitude pulmonary edema (HAPE)

As with other forms of pulmonary edema, oxygen is the usually the first treatment. If supplemental oxygen isn't available, you may use portable hyperbaric chambers, which imitate a descent for several hours until you are able to move to a lower elevation.

Treatments for high-altitude pulmonary edema (HAPE) also include:

- **Immediately descending to a lower elevation.** If you're climbing or traveling at high altitudes and have mild symptoms of HAPE, descend 1,000 to 3,000 feet (about 300 to 1,000 meters) as quickly as you can, within reason. Depending on

the severity of your condition, you may need rescue assistance to get off the mountain.

- **Stop exercising and stay warm.** Physical activity and cold can make pulmonary edema worse.
- **Medication.** Some climbers take prescription medications such as acetazolamide or nifedipine (Adalat CC, Procardia) to help treat or prevent symptoms of HAPE. To prevent HAPE, medication is started at least one day before ascent.

Clinical trials

Explore Mayo Clinic studies testing new treatments, interventions and tests as a means to prevent, detect, treat or manage this condition.

Lifestyle and home remedies

Lifestyle changes are an important part of heart health and can help you manage some forms of pulmonary edema.

- **Keep blood pressure under control.** If you have high blood pressure, take your medications as prescribed and check your blood pressure regularly. Record the results. Ask your doctor for your target blood pressure.
- **Manage other medical conditions.** Address any underlying medical conditions, such as controlling your glucose levels if you have diabetes.
- **Avoid the cause of your condition.** If pulmonary edema results from drug use or high altitudes, for example, you'll want to avoid these things to prevent further lung damage.
- **Don't smoke.** It's always a healthy idea to stop smoking. If you need help quitting, talk to your doctor. He or she can provide tips and, sometimes, medications to help you quit smoking.

- **Eat less salt.** Salt helps your body retain fluid. In some people with severely damaged left ventricular function, getting too much salt may be enough to trigger congestive heart failure. Your doctor may recommend a low-salt diet. If you need help, a dietitian can show you how to determine the salt content in foods and create a nutritious, good-tasting diet. In general, most people should consume less than 2,300 milligrams a day of salt (sodium). Ask your doctor what level is safe for you.
- **Choose a healthy diet.** You'll want to eat a plenty of fruits, vegetables and whole grains. Limit saturated fats and Trans fats, added sugars, and sodium.
- **Manage your weight.** Being even slightly overweight increases your risk of cardiovascular disease. On the other hand, even losing small amounts of weight can lower your blood pressure and cholesterol and reduce your risk of diabetes.
- **Get regular exercise.** Healthy adults should get at least 150 minutes of moderate aerobic activity or 75 minutes of vigorous aerobic activity a week, or a combination of the two. If you're not used to exercise, start out slowly and build up gradually. Be sure to get your doctor's OK before starting an exercise program.

SRI LAKSHMI NARAYANA INSTITUTE OF ALLIED HEALTH SCIENCE

MEDICAL EDUCATIONAL PROJECT

Pulmonary edema and Left Ventricular Failure - VAC01/AHS/2019-15/07

SlNo.	Name of the Students	University Register Number	Signature
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10	**GOKUL PRASAD**	**UAH1802159**	
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15	**MOHAMMED AFSAL.N**	**UAH1802166**	
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SRI LAKSHMI NARAYANA INSTITUE OF HIGHER EDUCATON AND RESEARCH

Annexure - III

Assessment Form

Sri Lakshmi Narayana Institute of Medical Sciences, Pondicherry

Course code: VAC01/AHS/2019-15/07

Multiple Choice Question 10x2=20

1) A 73-year-old male presents with acute pulmonaryoedema. His blood pressure is 180/110 mm Hg And heart rate 120 beats min−1 (sinus rhythm, QRSduration <100 ms), and he has cool peripheries. His serum lactate is 5 (normal 0.6–1.3) mmol litre−1 and there is left ventricular hypertrophy (LVH) on his ECG but no ischaemic changes. Thecardiac silhouette is not enlarged on chest X-ray. The following statements regarding cardiac function are correct:

(a). His cardiac output is likely to be limited byimpaired left ventricle (LV) filling.
(b). The presence of pulmonary oedema and elevated serum lactate concentrations indicates a reduced ejection fraction.
(c). Myocardial oxygen demand is likely to beincreased during this episode.
(d). The patient's blood pressure suggestsadequate tissue perfusion.

2) Regarding the pharmacological management ofacute decompensated heart failure (ADHF):
(a). Dobutamine is likely to be useful in the supportive treatment of ADHF caused by mitral incompetence.
(b). Dopamine has a positive inotropic effect.
(c). Levosimendan is likely to be usefullycombined with a α-1 adrenergic agonist.
(d). Opioid toxicity is associated with increased right ventricular (RV) afterload.
(e). Continued use of drugs with negative inotropic effects should generally be avoided in decompensated cardiac failure

3) An elderly, normotensive female patient is recovering from an episode of acute decompensated heart failure during which she hada good response to nitrates and diuretics, and a short spell of non-invasive ventilation. She is now in a 'post-stabilization' phase of her management. Her echocardiogram shows a mildly dilated left ventricle with an ejection fraction (EF) of 40%. She has a resting heart rate of 90 beats min−1 (sinus rhythm), blood pressure of 110/65 mm Hg and oxygen saturation of 95% on room air, but shortness of breath when moving from bed to chair. Her creatinine clearance is normal. The following therapies may be advocated as demonstrating survival benefit for her heart failure:
(A). Calcium antagonists.
(b). β-Blockers.
(c). Aldosterone antagonists.
(d). Furosemide infusion.
(e). Low-dose epinephrine infusion to relieve pulmonary congestion and improve tissueperfusion.

4) A 76-year-old male who has had a previous myocardial infarction presents with acute decompensated heart failure (ADHF). His transthoracic echocardiogram confirms an ejectionfraction (EF) of <35% and the 12-lead ECG is reported as 68 beats min−1 with second-degree heart block and left bundle branch block. The QRS duration is 160 Ms. He is haemodynamically stable, in no

respiratory distress and comfortable, but requires dobutamine and noradrenaline to maintain adequate cardiac output and perfusion pressure. From the information, available, the following therapies should be considered:

(a). B-Block.
(b). Angiotensin II receptor blockers.
(c). Implantable cardioverter defibrillator (ICD).
(d). Morphine.
(e). Cardiac resynchronization therapy

5) In acute respiratory distress syndrome (ARDS):(a). The diagnosis can be made on the ratio of Arterial oxygen partial pressure to fractional inspired oxygen (PaO2/FiO2 ratio), regardless of pressures used to ventilate the lungs.
(a). The diagnosis requires direct measurement ofintracardiac pressures.
(b). The mild form has a mortality rate of 27%.
(c). The onset is slow and insidious.
(d). Patients develop reduced pulmonary compliance and increased ventilation perfusion mismatch.

6) The pathophysiology of acute respiratory distresssyndrome (ARDS) includes:

(a). Production of inflammatory mediators, usually reduced by non-steroidal anti-inflammatory drugs (NSAIDs) as management of the disease.
(b). Fibroproliferation and microvascular thrombusformation in the first few hours of a known insult.
(c). An acute phase characterized by hypoxaemiaand flooding of the lungs with low-protein fluid.
(d). An inevitable progression to widespreadfibrosis and lung remodelling.
(e). Radiological imaging demonstratinghomogeneous lung fields.

7) Regarding management strategies for acuterespiratory distress syndrome (ARDS):

(a). Aiming for normal gas exchange can worsenthe disease process.
(b). An optimal level of positive end-expiratory pressure (PEEP) at 5 cm H2O has been identified and recommended by the ARDSnetgroup.
(c). Driving ventilator pressure (ΔP), when reduced,is strongly associated with survival.
(d). High-frequency oscillation ventilation (HFOV) is associated with higher mortality than conventional ventilation.
(e). Prone positioning is a simple, low-risk procedure that should be performed in anypatient with a diagnosis of ARDS.

8) Appropriate statements concerning acute respiratory distress syndrome (ARDS) include the following:

(a). There is level-1 evidence supporting the use ofsteroids in early ARDS.
(b). Initial ventilator settings for a newly diagnosedARDS patient include a tidal volume of 6 ml kg^{-1}.
(c). There is clear evidence of a mortality benefit for a conservative fluid management strategyin ARDS.
(d). Inhaled nitric oxide improves oxygenation at24 h but does not improve the likelihood of survival.
(e). On follow-up, most survivors of ARDS returnto normal function by 5 years after the illness

9) With reference to modern defibrillators: (a). They are most likely to use a triphasic Waveform.
(b). The duration of the biphasic truncated exponential (BTE) waveform is limited to 10Ms.
(c). The rectilinear biphasic (RB) waveform uses an inductor to control current flow during the initial phase of the biphasic waveform.
(d). Defibrillators using either the RB or the BTEwaveform have similar success rates for cardioversion of atrial fibrillation.
(e). Biphasic defibrillators can be used for direct defibrillation or direct current (DC) cardioversion of the heart during cardiac surgery.

10) Appropriate indications for direct current (DC)cardioversion include the following:

(a). Atrial fibrillation in a patient with Wolff–Parkinson–White (WPW) syndrome.
(b). A patient with digoxin-induced ventriculartachycardia (VT).
(c). A multifocal atrial tachycardia (MAT) in a critical care patient with pneumonia receiving norepinephrine and dobutamine infusions.
(d). A narrow complex tachyarrhythmia in a patientwith associated haemodynamic instability.
(e). A patient with atrial fibrillation in whom a rate control strategy has proved unsuccessful, with poor symptomatic control.

SRI LAKSHMI NARAYANA INSTITUE OF HIGHER EDUCATON AND RESEARCH

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SRI LAKSHMI NARAYANA INSTITUE OF HIGHER EDUCATON AND RESEARCH

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3) An elderly, normotensive female patient is recovering from an episode of acute decompensated heart failure during which she hada good response to nitrates and diuretics, and a short spell of non-invasive ventilation. She is now in a 'post-stabilization' phase of her management. Her echocardiogram shows a mildly dilated left ventricle with an ejection fraction (EF) of 40%. She has a resting heart rate of 90 beats min−1 (sinus rhythm), blood pressure of 110/65 mm Hg and oxygen saturation of 95% on room air, but shortness of breath when moving from bed to chair. Her creatinine clearance is normal. The following therapies may be advocated as demonstrating survival benefit for her heart failure:
(A). Calcium antagonists.
(b). β-Blockers.
(c). Aldosterone antagonists.
(d). Furosemide infusion.
(e). Low-dose epinephrine infusion to relieve pulmonary congestion and improve tissueperfusion.

4) A 76-year-old male who has had a previous myocardial infarction presents with acute decompensated heart failure (ADHF). His transthoracic echocardiogram confirms an ejectionfraction (EF) of <35% and the 12-lead ECG is reported as 68 beats min−1 with second-degree heart block and left bundle branch block. The QRS duration is 160 Ms. He is haemodynamically stable, in no

SRI LAKSHMI NARAYANA INSTITUE OF HIGHER EDUCATON AND RESEARCH

respiratory distress and comfortable, but requires dobutamine and noradrenaline to maintain adequate cardiac output and perfusion pressure. From the information, available, the following therapies should be considered:

(a). B-Block.
(b). Angiotensin II receptor blockers.
(c). Implantable cardioverter defibrillator (ICD).
(d). Morphine.
(e). Cardiac resynchronization therapy

5) In acute respiratory distress syndrome (ARDS):(a). The diagnosis can be made on the ratio of Arterial oxygen partial pressure to fractional inspired oxygen (PaO2/FiO2 ratio), regardless of pressures used to ventilate the lungs.
(a). The diagnosis requires direct measurement ofintracardiac pressures.
(b). The mild form has a mortality rate of 27%.
(c). The onset is slow and insidious.
(d). Patients develop reduced pulmonary compliance and increased ventilation perfusion mismatch.

6) The pathophysiology of acute respiratory distresssyndrome (ARDS) includes:

(a). Production of inflammatory mediators, usually reduced by non-steroidal anti-inflammatory drugs (NSAIDs) as management of the disease.
(b). Fibroproliferation and microvascular thrombusformation in the first few hours of a known insult.
(c). An acute phase characterized by hypoxaemiaand flooding of the lungs with low-protein fluid.
(d). An inevitable progression to widespreadfibrosis and lung remodelling.
(e). Radiological imaging demonstratinghomogeneous lung fields.

7) Regarding management strategies for acuterespiratory distress syndrome (ARDS):

(a). Aiming for normal gas exchange can worsenthe disease process.
(b). An optimal level of positive end-expiratory pressure (PEEP) at 5 cm H2O has been identified and recommended by the ARDSnetgroup.
(c). Driving ventilator pressure (ΔP), when reduced,is strongly associated with survival.
(d). High-frequency oscillation ventilation (HFOV) is associated with higher mortality than conventional ventilation.
(e). Prone positioning is a simple, low-risk procedure that should be performed in anypatient with a diagnosis of ARDS.

8) Appropriate statements concerning acute respiratory distress syndrome (ARDS) include the following:

(a). There is level-1 evidence supporting the use ofsteroids in early ARDS.
(b). Initial ventilator settings for a newly diagnosedARDS patient include a tidal volume of 6 ml kg^{-1}.
(c). There is clear evidence of a mortality benefit for a conservative fluid management strategyin ARDS.
(d). Inhaled nitric oxide improves oxygenation at24 h but does not improve the likelihood of survival.
(e). On follow-up, most survivors of ARDS returnto normal function by 5 years after the illness

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9) With reference to modern defibrillators: (a). They are most likely to use a triphasic Waveform.
(b). The duration of the biphasic truncated exponential (BTE) waveform is limited to 10Ms.
(c). The rectilinear biphasic (RB) waveform uses an inductor to control current flow during the initial phase of the biphasic waveform.
(d). Defibrillators using either the RB or the BTEwaveform have similar success rates for cardioversion of atrial fibrillation.
(e). Biphasic defibrillators can be used for direct defibrillation or direct current (DC) cardioversion of the heart during cardiac surgery.

10) Appropriate indications for direct current (DC)cardioversion include the following:

(a). Atrial fibrillation in a patient with Wolff–Parkinson–White (WPW) syndrome.
(b). A patient with digoxin-induced ventriculartachycardia (VT).
(c). A multifocal atrial tachycardia (MAT) in a critical care patient with pneumonia receiving norepinephrine and dobutamine infusions.
(d). A narrow complex tachyarrhythmia in a patientwith associated haemodynamic instability.
(e). A patient with atrial fibrillation in whom a rate control strategy has proved unsuccessful, with poor symptomatic control.

SRI LAKSHMI NARAYANA INSTITUE OF HIGHER EDUCATON AND RESEARCH

ARULMOZIHI. A
UAH1802153.

SRI LAKSHMI NARAYANA INSTITUE OF HIGHER EDUCATON AND RESEARCH

Annexure - III

Assessment Form

Sri Lakshmi Narayana Institute of Medical Sciences, Pondicherry

Course code: VAC01/AHS/2019-15/07

Multiple Choice Question 10x2=20

1) A 73-year-old male presents with acute pulmonaryoedema. His blood pressure is 180/110 mm Hg And heart rate 120 beats min−1 (sinus rhythm, QRSduration <100 ms), and he has cool peripheries. His serum lactate is 5 (normal 0.6–1.3) mmol litre−1 and there is left ventricular hypertrophy (LVH) on his ECG but no ischaemic changes. Thecardiac silhouette is not enlarged on chest X-ray. The following statements regarding cardiac function are correct:

(a). His cardiac output is likely to be limited byimpaired left ventricle (LV) filling.
(b). The presence of pulmonary oedema and elevated serum lactate concentrations indicates a reduced ejection fraction.
(c). Myocardial oxygen demand is likely to beincreased during this episode.
(d). The patient's blood pressure suggestsadequate tissue perfusion.

2) Regarding the pharmacological management ofacute decompensated heart failure (ADHF):
(a). Dobutamine is likely to be useful in the supportive treatment of ADHF caused by mitral incompetence.
(b). Dopamine has a positive inotropic effect.
(c). Levosimendan is likely to be usefullycombined with a α-1 adrenergic agonist.
(d). Opioid toxicity is associated with increased right ventricular (RV) afterload.
(e). Continued use of drugs with negative inotropic effects should generally be avoided in decompensated cardiac failure

3) An elderly, normotensive female patient is recovering from an episode of acute decompensated heart failure during which she hada good response to nitrates and diuretics, and a short spell of non-invasive ventilation. She is now in a 'post-stabilization' phase of her management. Her echocardiogram shows a mildly dilated left ventricle with an ejection fraction (EF) of 40%. She has a resting heart rate of 90 beats min−1 (sinus rhythm), blood pressure of 110/65 mm Hg and oxygen saturation of 95% on room air, but shortness of breath when moving from bed to chair. Her creatinine clearance is normal. The following therapies may be advocated as demonstrating survival benefit for her heart failure:
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respiratory distress and comfortable, but requires dobutamine and noradrenaline to maintain adequate cardiac output and perfusion pressure. From the information, available, the following therapies should be considered:

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(e). A patient with atrial fibrillation in whom a rate control strategy has proved unsuccessful, with poor symptomatic control.

Sri Lakshmi Narayana Institute of Medical Sciences

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(Deemed to be University under section 3 of the UGC Act 1956)

CERTIFICATE OF MERIT

This is to certify that **GOPIKA.K (UAH1802160)** has actively participated in the Value Added Course on **Congestive Heart Failure And Pulmonary Edema(VAC01/AHS/2019-15/07)** held during month Organized by Sri Lakshmi Narayana Institute of Medical Sciences, Pondicherry- 605 502, India.

RESOURCE PERSON

Dr. G.Somasundram

COORDINATOR

Sri Lakshmi Narayana Institute of Medical Sciences

Affiliated to Bharath Institute of Higher Education & Research

(Deemed to be University under section 3 of the UGC Act 1956)

CERTIFICATE OF MERIT

This is to certify that **ARAVINTH.S(UAH1802151)** has actively participated in the Value Added Course on **Congestive Heart Failure And Pulmonary Edema(VAC01/AHS/2019-15/07)** held during month Organized by Sri Lakshmi Narayana Institute of Medical Sciences, Pondicherry- 605 502, India.

RESOURCE PERSON

Dr. G.Somasundram

COORDINATOR

Annexure- V

Student Feedback Form

Course Name: Congestive Heart Failure and Pulmonary Edema

Subject Code: VAC01/AHS/2019-15/07

Name of Student: _____ Roll No.: _____

We are constantly looking to improve our classes and deliver the best training to you. Your evaluations, comments and suggestions will help us to improve our performance

Feedback Form

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
1. The course met my expectations.	○	○	○	○	○
2. I will be able to apply the knowledge learned.	○	○	○	○	○
3. The course objectives for each topic were identified and followed.	○	○	○	○	○
4. The content was organised and easy to follow.	○	○	○	○	○
5. The quality of instruction was good.	○	○	○	○	○
6. Class participation and interaction were encouraged.	○	○	○	○	○
7. Adequate time was provided for questions and discussion.	○	○	○	○	○

8. How do you rate the course overall?
   - ○ Excellent
   - ○ Good
   - ○ Average
   - ○ Poor
   - ○ Very poor

9. The aspects of the course could be improved?

10. Other comments?

Signature of the Student:
Date:

Annexure- V

Student Feedback Form

Course Name: Congestive Heart Failure and Pulmonary Edema

Subject Code: VAC01/AHS/2019-15/07

Name of Student: ABIJITH.C.C Roll No.: 0AH1802150

We are constantly looking to improve our classes and deliver the best training to you. Your evaluations, comments and suggestions will help us to improve our performance

Feedback Form

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
1. The course met my expectations.	✓				
2. I will be able to apply the knowledge learned.		✓			
3. The course objectives for each topic were identified and followed.			✓		
4. The content was organised and easy to follow.	✓				
5. The quality of instruction was good.		✓			
6. Class participation and interaction were encouraged.		✓			
7. Adequate time was provided for questions and discussion.	✓				

8. How do you rate the course overall?
   - Excellent
   - ✓ Good
   - Average
   - Poor
   - Very poor

9. The aspects of the course could be improved?

   NO.

10. Other comments?

    Class was

Signature of the Student: Abijith.
Date: 14/8/19

Annexure- V

Student Feedback Form

Course Name: Congestive Heart Failure and Pulmonary Edema

Subject Code: VAC01/AHS/2019-15/07

Name of Student: ARUL. B Roll No.: UAH1802152

We are constantly looking to improve our classes and deliver the best training to you. Your evaluations, comments and suggestions will help us to improve our performance

Feedback Form

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
1. The course met my expectations.	✓				
2. I will be able to apply the knowledge learned.		✓			
3. The course objectives for each topic were identified and followed.	✓				
4. The content was organised and easy to follow.		✓			
5. The quality of instruction was good.			✓		
6. Class participation and interaction were encouraged.	✓				
7. Adequate time was provided for questions and discussion.		✓			

8. How do you rate the course overall?
   - ✓ Excellent
   - Good
   - Average
   - Poor
   - Very poor

9. The aspects of the course could be improved?

   NO.

10. Other comments?

    Now I can able. understand CHF and PE

Signature of the Student: Arul.

Date: 14/08/19

Date: 20.08.2019

From

Dr.G.Somasundram
Department of Pharmacology,
Sri Lakshmi Narayana Institute of Medical Sciences
Bharath Institute of Higher Education and Research,
Chennai.

Through Proper Channel

To

The Dean,
Sri Lakshmi Narayana Institute of Medical Sciences
Bharath Institute of Higher Education and Research,
Chennai.

Sub: Completion of value-added course: Congestive Heart Failure and Pulmonary Edema

Dear Sir,

With reference to the subject mentioned above, the department has conducted the value-added course titled: "**Congestive Heart Failure and Pulmonary Edema"** July to September 2019 for 30 AHS Students. We solicit your kind action to send certificates for the participants that is attached with this letter. Also, I am attaching the photographs captured during the conduct of the course.

Kind Regards,

Dr.G.Somasundram

Encl: Certificates

Photographs

Sri Lakshmi Narayana Institute of Medical Sciences

Date: 05.08.2017

From

Dr.G.Somasundram
Principal of Allied Health Sciences,
Sri Lakshmi Narayana Institute of Medical Sciences
Bharath Institute of Higher Education and Research,
Chennai.

To

The Dean,
Sri Lakshmi Narayana Institute of Medical College
Bharath Institute of Higher Education and Research,
Chennai.

Sub: Permission to conduct value-added course: Pericardiocentesis

Dear Sir,

With reference to the subject mentioned above, the department proposes to conduct a value-added course titled: **Pericardiocentesis** from September to October 2019. We solicit your kind permission for the same.

Kind Regards

Dr.G.Somasundram

FOR THE USE OF DEANS OFFICE

Names of Committee members for evaluating the course:

The Dean: **Dr. Jayalakshmi**

The HOD: **Dr. Somasundram. G**

The Expert: **Dr. Pasmithadevi**

The committee has discussed about the course and is approved.

Dean	Subject Expert	HOD
(Sign & Seal)	(Sign & Seal)	(Sign & Seal)

Dr. G. JAYALAKSHMI, BSC., MBBS., DTCD., M.D.,
DEAN
Sri Lakshmi Narayana Institute of Medical Sciences
Osudu, Agaram, Kudapakkam Post,
Villianur Commune, Puducherry - 605502.

PRINCIPAL
Allied Health Sciences
Sri Lakshmi Narayana Institute of Allied Health Sciences
Osudu, Agaram Post, Puducherry - 605 502.

OFFICE OF THE DEAN

Sri Lakshmi Narayana Institute of Medical Sciences

OSUDU, AGARAM VILLAGE, VILLIANUR COMMUNE, KUDAPAKKAM POST,
PUDUCHERRY - 605 502.
[Recognised by Medical Council of India, Ministry of Health letter No. U/12012/249/2005-ME (P -II) dt. 11/07/2011]
[Affiliated to Bharath University, Chennai - TN]

Circular

31.08.2017

Sub: Organizing Value-added Course: "Pericardiocentesis".reg

With reference to the above mentioned subject, it is to bring to your notice that Sri Lakshmi Narayana Institute of Medical Sciences, **Bharath Institute of Higher Education and Research** is organizing **"Pericardiocentesis"**. The course content and registration form is enclosed below."

The application must reach the institution along with all the necessary documents as mentioned. The hard copy of the application should be sent to the institution by registered/ speed post only so as to reach on or before September to October 2019. Applications received after the mentioned date shall not be entertained under any circumstances.

Dean

Dr. G. JAYALAKSHMI, BSC., MBBS., DTCD., M.D.,
DEAN
Sri Lakshmi Narayana Institute of Medical Sciences
Osudu, Agaram, Kudapakkam Post,
Villianur Commune, Puducherry - 605502.

Encl: Copy of Course content

VALUE ADDED COURSE

1. Name of the programme & Code

"Pericardiocentesis" & VAC02/AHS/2019-16/09

2. Duration & Period

30 hrs. & September to October 2019

3. Information Brochure and Course Content of Value Added Courses

Enclosed as Annexure- I

4. List of students enrolled

Enclosed as Annexure- II

5. Assessment procedures:

Assessment - *Enclosed as Annexure- III*

6. Certificate model

Enclosed as Annexure- IV

7. No. of times offered during the same year:

1 time September to October 2019

8. Year of discontinuation: 2020

9. Summary report of each program year-wise

Value Added Course- September to October 2019					
Sl. No	**Course Code**	**Course Name**	**Resource Persons**	**Target Students**	**Strength & Year**
1	VAC02/AHS/2019-16/09	**Pericardiocentesis**	Dr. Pasmithadevi	AHS	30 AHS students September to October 2019

10. Course Feed Back

Enclosed as Annexure- V

RESOURCE PERSON

COORDINATOR
Dr.G.Somasundram

PRINCIPAL
Allied Health Sciences
Sri Lakshmi Narayana Institute of Allied Health Sciences
Osudu, Agaram Post, Puducherry - 605 502.

Course Proposal

Course Title: "**Pericardiocentesis"**

Course Objective:

1. To enhance the performance skill in Pericardiocentesis.
2. To assess the reaction of target allied Health students in Pericardiocentesis getting their feedback.

Course Outcome: Improvement in the "Pericardiocentesis"
Course Audience: Students of AHS Batch
Course Coordinator: Dr.G.Somasundram
Course Faculties with Qualification and Designation:
1. Dr.Pasmithadevi
Course Curriculum/Topics with schedule (Min of 30 hours)

SlNo	Date	Topic	Time	Hours
1.	16.09.2019	Introduction to Pericardiocentesis	4-6p.m	2
2.	17.09.2019	What is Pericardiocentesis	2-4p.m	2
3.	19.09.2019	Pericarditis	4-6p.m	2
4.	20.09.2019	Pericardial effusion	4-6p.m	2
5.	22.09.2019	Cardiac Tamponade	4-6p.m	2
6.	23.09.2019	Complications of Pericarditis	4-6p.m	2
7.	25.09.2019	Indications of Pericardiocentesis	4-6P.M	2
8.	27.09.2019	Contraindications for Pericardiocentesis	4-6p.m	2
9.	30.09.2019	Video demonstration Pericardiocentesis	4-6p.m	2
10.	04.09.2019	Risk of Pericardiocentesis	4-6p.m	2
11.	05.09.2019	Diagnostic procedure involved in Pericarditis	4-6p.m	2
12.	07.09.2019	Echo in Pericarditis	4-6p.m	2
13.	10.09.2019	Pre course and Post Course evaluation, Feedback analysis	2-4p.m	2
14.	11.09.2019	Steps model explanation and various performance assessment	4-6p.m	2 m
15.	12.09.2019	Orientation of the students about the training program and	2-4p.m	2

		assessment		
		Total		30 hrs.

REFERENCE BOOKS:

1.Gupta, Pooja; Ibrahim, Amar; Butany, Jagdish (2014-01-01), Willis, Monte S.; Homeister, Jonathon W.; Stone, James R. (eds.), "Chapter 16 - The Pericardium and its Diseases", Cellular and Molecular Pathobiology of Cardiovascular Disease, San Diego: Academic Press, pp. 297–314, doi:10.1016/b978-0-12-405206-2.00016-8, ISBN 978-0-12-405206-2.

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3.Fashoyin-Aje, Lola A.; Brahmer, Julie R. (2020-01-01), Niederhuber, John E.; Armitage, James O.; Kastan, Michael B.; Doroshow, James H. (eds.), "59 - Malignancy-Related Effusions", Abeloff's Clinical Oncology (Sixth Edition), Philadelphia: Elsevier, pp. 863–873.e4, doi:10.1016/b978-0-323-47674-4.00059-1, ISBN 978-0-323-47674-4.

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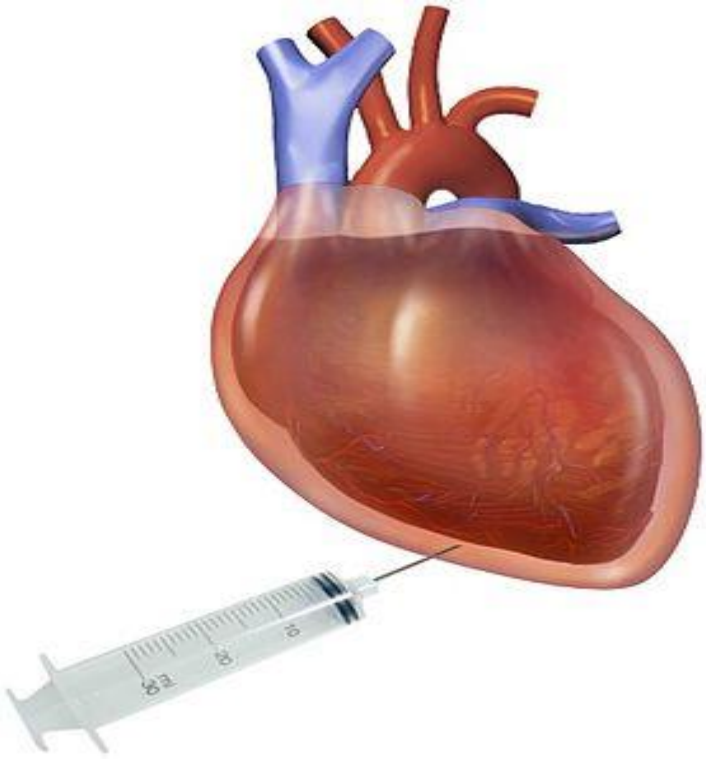
PERICARDIOCENTESIS

Contents

Pericardiocentesis



Pericardiocentesis (PCC), also called pericardial tap, is a medical procedure where fluid is aspirated from the pericardium (the sac enveloping the heart).

Uses

Cardiac tamponade

Pericardiocentesis can be used to diagnose and treat cardiac tamponade. Cardiac tamponade is a medical emergency in which excessive accumulation of fluid within the pericardium (pericardial effusion) creates increased pressure.[3] This prevents the heart from filling normally with blood. This can critically decrease the amount of blood that is pumped from the heart, causing obstructive shock, which can be lethal. The removal of the excess fluid reverses this dangerous process, and is often the first treatment for cardiac tamponade due to its speed.

Analysis of pericardial fluid

It can also be used to analyze the fluid surrounding the heart. Fluid may be analysed to differentiate a number of conditions, including.

- infection
- spread of cancer
- autoimmune conditions, such as lupus and rheumatoid arthritis

Pericarditis

Pericardiocentesis can relieve the symptoms of pericarditis. There may be a normal amount of pericardial fluid, but inflammation still causes compression of the heart. Removal of some of this fluid reduces pressure on the heart.

What is pericarditis?

Pericarditis is an inflammation of the pericardium. Pericarditis is usually acute – it develops suddenly and may last up to several months. The condition usually clears up after 3 months, but sometimes attacks can come and go for years. When you have pericarditis, the membrane around your heart is red and swollen, like the skin around a cut that becomes inflamed. Sometimes there is extra fluid in the space between the pericardial layers, which is called pericardial effusion. Pericarditis can affect anyone, but it is most common in men aged 16 to 65.

SYMPTOMS AND CAUSES

What are the symptoms of pericarditis?

Pericarditis can cause chest pain that:

- Is sharp and stabbing (caused by the heart rubbing against the pericardium)
- May get worse when you cough, swallow, take deep breaths or lie flat
- Feels better when you sit up and lean forward

You also may feel the need to bend over or hold your chest to breathe more comfortably.

Other symptoms include:

- Pain in your back, neck or left shoulder Trouble breathing when you lie down
- A dry cough

- Anxiety or fatigue

Pericarditis can cause swelling in your feet, legs and ankles. This swelling may be a symptom of constrictive pericarditis. This is a serious type of pericarditis where the pericardium gets hard and/or thick. When this happens, the heart muscle can't expand, and it keeps your heart from working like it should. Your heart can become compressed, which causes blood to back up into your lungs, abdomen and legs, and cause swelling. You can also develop an abnormal heart rhythm.

If you have symptoms of constrictive pericarditis, including shortness of breath, swelling of the legs and feet, water retention, heart palpitations, and severe swelling of the abdomen, call your cardiologist to schedule an evaluation.

Pericardial effusion and cardiac tamponade

When there is a fluid build-up in the space between the pericardium, it can cause a condition called pericardial effusion. If the fluid builds up quickly, it can cause cardiac tamponade. This is a sudden build-up of fluid in between the layers of the pericardium that keeps your heart from working like it should and can cause your blood pressure to drop. Cardiac tamponade is life-threatening and requires immediate drainage of the fluid.

If you have any symptoms of acute pericarditis, call your doctor right away. If you feel your symptoms are a medical emergency, call 911 right away to get treatment at the nearest hospital.

What causes pericarditis?

There are many causes of pericarditis:

- Viral pericarditis is caused by a complication of a viral infection, most often a gastrointestinal virus.
- Bacterial pericarditis is caused by a bacterial infection, including tuberculosis.
- Fungal pericarditis is caused by a fungal infection.
- Parasitic pericarditis is caused by an infection from a parasite.
- Some autoimmune diseases, such as lupus, rheumatoid arthritis and scleroderma can cause pericarditis. Other causes of pericarditis include injury to the chest, such as after a car accident (traumatic

pericarditis), other health problems such as kidney failure (uremic pericarditis), and tumors, genetic diseases such as Familial Mediterranean Fever (FMF), or rarely, medications that suppress the immune system.

Your risk of pericarditis is higher after a heart attack, heart surgery (postpericardiotomy syndrome), radiation therapy or a percutaneous treatment, such as cardiac catheterization or radiofrequency ablation (RFA). In these cases, it is likely that the inflammation of the pericardium is an error in the body's response to the procedure or condition. It can sometimes take several weeks for symptoms of pericarditis to develop after bypass surgery.

Many times, the cause of pericarditis is unknown. This is called idiopathic pericarditis.

About 15-30% of patients with pericarditis have repeat episodes of pericarditis that come and go for many years.

DIAGNOSIS AND TESTS

How is pericarditis diagnosed?

Sharp pain in the chest and back of the shoulders and difficulty breathing are 2 major clues that you may have pericarditis rather than a heart attack. Your doctor will talk to you about your symptoms and medical history, such as whether you have recently been sick and review your history of heart conditions, surgery and other health problems that could put you at a higher risk of pericarditis.

Your doctor will listen to your heart. Pericarditis can cause a rubbing or creaking sound, caused by the rubbing of the inflamed lining of the pericardium. This is called the "pericardial rub" and is best heard when you lean forward, hold your breath and breathe out. Depending on how bad the inflammation is, your doctor may also hear crackles in your lungs, which are signs of fluid in the space around the lungs or extra fluid in the pericardium.

Cleveland Clinic imaging specialists in the Center for the Diagnosis and Treatment of Pericardial Diseases often use a variety of ways to check for pericarditis and any complications, such as pericardial effusion or constrictive pericarditis. You may need one or more tests, such as:

- Chest X-ray to see the size of your heart and any fluid in your lungs.
- Electrocardiogram (ECG or EKG) to look for changes in your heart rhythm. In about half of all patients with pericarditis, the heart rhythm goes through a sequence of four distinct patterns. Some patients do not have any changes, and if they do, they may be temporary.
- Echocardiogram (echo) to see how well your heart is working and check for fluid or pericardial effusion around the heart. An echo will show the classic signs of constrictive pericarditis, including a stiff or thick pericardium that constricts the heart's normal movement.
- Cardiac MRI to check for extra fluid in the pericardium, pericardial inflammation or thickening, or compression of the heart. A contrast agent called gadolinium is used during this highly specialized test.
- CT scan to look for calcium in the pericardium, fluid, inflammation, tumors and disease of the areas around the heart. Iodine dye is used during the test to get more information about the inflammation. This is an important test for patients who may need surgery for constrictive pericarditis.
- Cardiac catheterization to get information about the filling pressures in the heart. This is used to confirm a diagnosis of constrictive pericarditis.

Blood tests can be used to make sure you are not having a heart attack, to see how well your heart is working, test the fluid in the pericardium and help find the cause of pericarditis. If you have pericarditis, it is common for your sedimentation rate (ESR) and ultra-sensitive C reactive protein levels (markers of inflammation) to be higher than normal. You may need other tests to check for autoimmune diseases like lupus and rheumatoid arthritis.

Contra-indications

Long-term drainage

Pericardiocentesis is a one-off procedure, which may not be appropriate for long-term drainage. In cases where longer term drainage is needed, the cardiothoracic surgeon can create a pericardial window. This involves the removal of a section of the pericardium, and the placement of a chest tube.

Aortic dissection

Pericardiocentesis is not appropriate if cardiac tamponade is associated with aortic dissection. In this case, there is a high risk of the procedure worsening this aortic dissection by causing hemorrhage.

Diagnosis of pericardial effusion

Pericardiocentesis is not usually useful for diagnosis of more minor pericardial effusion.

Risks

Less than 1.5% of patients experience complications from Pericardiocentesis. The most common complications are lacerations of coronary arteries, and puncture of the left ventricle (with associated bleeding from both). Echocardiograms can help to identify complications. Blind approaches are typically only advised in emergencies, and a guided approach is typically preferred (using echocardiography).

Technique

Position

The patient undergoing Pericardiocentesis is positioned supine with the head of the bed raised between a 30 and 60 degree angle. This places the heart in proximity to the chest wall for easier insertion of the needle into the pericardial sac. Anatomically, the procedure is carried out under the xiphoid process, up and leftwards.

Process

Pericardiocentesis is usually performed using a local anaesthetic. A wide-bore catheter is inserted. More modern procedures may be performed in a cardiac catheterization lab.

There are two locations that Pericardiocentesis can be performed without puncturing the lungs.

The most standard location is through the infrasternal angle and is also called subxiphoid approach. The needle is inserted at an angle between 30 and 45 degrees to the chest.

Another location is through the 5th or 6th intercostal space at the left sternal border at the cardiac notch of the left lung, and is also called as parasternal approach. The needle is inserted at an angle of 90 degrees to the chest. Some evidence suggests that this poses lower risk of vascular damage in adults.

Intraoperative assessment

Pericardiocentesis is generally done under ultrasound guidance to minimize complications. An electrocardiogram (ECG) is continuously recorded during Pericardiocentesis to assess for complications.

The Pericardium

The pericardium is a thin, two-layered, fluid-filled sac that covers the outer surface of the heart. It provides lubrication for the heart, shields the heart from infection and malignancy, and contains the heart in the chest wall. It also keeps the heart from over-expanding when blood volume increases, which keeps the heart functioning efficiently.

MANAGEMENT AND TREATMENT

What treatments are available for patients with pericarditis?

Medications

Treatment for acute pericarditis may include medication for pain and inflammation, such as ibuprofen and aspirin. Depending on the cause of your pericarditis, you may need an antibiotic or antifungal medication.

If your symptoms are severe, last longer than 2 weeks, or clear up and then return, your doctor may also prescribe an anti-inflammatory drug called colchicine. Colchicine can help control the inflammation and prevent pericarditis from returning weeks or even months later.

If you need to take large doses of ibuprofen, your doctor may prescribe medications to ease gastrointestinal symptoms. If you take large doses of

nonsteroidal anti-inflammatory drugs (NSAIDs), you will need frequent follow-up appointments to look for changes in your kidney and liver function.

If you have chronic or recurrent pericarditis, you may need to take NSAIDs or colchicine for several years, even if you feel well. A diuretic ("water pill") usually helps get rid of the extra fluid caused by constrictive pericarditis. If you develop a heart rhythm problem, your doctor will talk to you about treatment.

Your doctor may also talk to you about treatment with steroids or other medications, such as azathioprine, IV human immunoglobulin, and anaconda.

Other treatments

Most times, medications are the only treatment needed for patients with pericarditis. But, if fluid builds up in the pericardium and compresses the heart, you may need a procedure called Pericardiocentesis. A long, thin tube called a catheter is used to drain the extra fluid. The catheter and a needle are guided to the pericardium with the use of echocardiography. If the fluid cannot be drained with the needle, a surgical procedure called a pericardial window is performed.

If you have constrictive pericarditis, you may need to have some of your pericardium removed. The surgery is called a pericardiectomy.

Surgery is not usually used as treatment for patients with recurrent pericarditis, but your doctor may talk to you about it if other treatments aren't successful.

Here are some key points about pericarditis. More detail and supporting information is in the main article.

- Pericarditis is a swelling of the pericardium, a sack-like tissue that contains the heart.
- The condition can have a number of causes, including bacterial or viral infection, parasites, or fungus.
- Most commonly, pericarditis is due to a virus.

- Symptoms of pericarditis include palpitations, a dry cough, and pain in the shoulder.
- In rare cases, pericarditis can permanently scar the pericardium.

SRI LAKSHMI NARAYANA INSTITUTE OF ALLIED HEALTH SCIENCE

MEDICAL EDUCATIONAL PROJECT

Pericardiocentesis - VAC02/AHS/2019-16/09

SlNo.	Name of the Students	University Register Number	Signature
1	**AKSHARA S**	**UAH1902203**	
2	**ANGEL ABRAHAM**	**UAH1902204**	
3	**ASWIN S**	**UAH1902205**	
4	**ATHIRA S RAJ**	**UAH1902206**	
5	**BARANI U**	**UAH1902207**	
6	**BUVANESWARI V**	**UAH1902208**	
7	**ELANTHIRAIYAN NS**	**UAH1902209**	
8	**GETZI R**	**UAH1902210**	
9	**GNANARITHICA G**	**UAH1902211**	
10	**GOKULDASSAN A**	**UAH1902212**	
11	**HARIHARASUDAN RM**	**UAH1902213**	
12	**HARINI H**	**UAH1902214**	
13	**INDUMATHI K**	**UAH1902215**	
14	**JAGADESHWARAN S**	**UAH1902216**	
15	**JANANI M**	**UAH1902217**	
16	**KHAMIL MUBARAK P**	**UAH1902218**	
17	**KANIMOZHI G**	**UAH1902219**	
18	**KARUPPASAMY P**	**UAH1902220**	
19	**KAVYAMADHU**	**UAH1902221**	
20	**KRISHNA S .RAJU**	**UAH1902222**	
21	**MALLO DIPUNG**	**UAH1902223**	
22	**MINNU PRASAD**	**UAH1902224**	
23	**NANDHINI R**	**UAH1902225**	
24	**NAVYA R**	**UAH1902226**	

25	**NILA K**	**UAH1902227**	
26	**NIRANJAN DEVI D**	**UAH1902228**	
27	**PAVITHRA P**	**UAH1902229**	
28	**PEMMADA JEEVAN PRAMOD**	**UAH1902230**	
29	**PETREESHIA RUBINI A**	**UAH1902231**	
30	**PRAVEEN KUMAR K**	**UAH1902232**	

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29	**PETREESHIA RUBINI A**	**UAH1902231**	Petreeshia Rubini A
30	**PRAVEEN KUMAR K**	**UAH1902232**	K. Praveen Kumar

SRI LAKSHMI NARAYANA INSTITUE OF HIGHER EDUCATON AND RESEARCH

Annexure - III

Assessment Form

Sri Lakshmi Narayana Institute of Medical Sciences, Pondicherry

Course code: VAC02/AHS/2019-16/09

Multiple Choice Question 10x2=20

1. What is the characteristic appearance of heart in cardiac tamponade?

   a. figure of 8 appearance
   b. wer vase heart
   c. coren sabot
   d. tear bottle heart

2. The three most common causes of cardiac tamponade are all accept?

   a. neoplastic disease
   b. idiopathic pericarditis
   c. pericardial effusion
   d. cardiac catheterization

3. What is the characteristic triad associated with cardiac tamponade?

   a. beck's triad
   b. sandblom's triad
   c. whipple's triad
   d. murphy's triad

4. All of the following are features of beck's triad except?

   a. soft or absent heart sounds
   b. hypotension
   c. jugular venous distension
   d. prominent y descent

5. All of the following are true about cardiac tamponade except?

   a. it can result by even 200 ml of fluid in the pericardial space , if it develops rapidly
   b. in slowly developing effusions more than 2000 ml of fluid can exist in the pericardial space
   c. the volume of fluid required to produce cardiac tamponade varies directly with the thickness of

the ventricular myocardium
d. the volume of fluid required to produce cardiac tamponade varies directly with the thickness of parietal pericardium

6. Which of these features aid in the diagnosis of cardiac tamponade?

a. Pulse paradoxes
b. Enlarged heart on chest radiograph
c. A kinesis of left ventricular wall on echocardiography
d. Low amplitude ECG voltage
e. Quiet heart sounds

7. The following are true regarding pericardial fluid:

a. its presence always confirms the diagnosis of tamponade
b. The normal volume of pericardial fluid is 15-20ml
c. Echocardiographic estimation of pericardial fluid volume strongly predicts clinical haemodynamic compromise
d. It has an exponential pressure volume relationship
e. Pericardiocentesis is only diagnostic in the management of cardiac tamponade

8. The following are true regarding the management of cardiac tamponade:

a. Pericardiocentesis is indicated in all forms of cardiac tamponade
b. Treatment involves careful fluid resuscitation and inotropes
c. Echocardiographic evidence of chamber collapse predicts a positive fluid responsiveness
d. Emergency drainage is indicated in tamponade with incipient cardiac arrest
e. Once the pericardial effusion is drained it may be necessary to wean infusions of inotropes and vasopressors

9. Which of the following is least likely to cause constrictive pericarditis

a. Tuberculosis pericardial effusion
b. Staphylococcal effusion
c. Post cardiac surgery
d. acute rheumatic fever

10. A type of pericarditis that's known for sharp chest pains.

a. TB Pericarditis
b. Constrictive Pericarditis
c. Fibrous Pericarditis

SRI LAKSHMI NARAYANA INSTITUE OF HIGHER EDUCATON AND RESEARCH

Nandhini.R.
VDH 190225

SRI LAKSHMI NARAYANA INSTITUE OF HIGHER EDUCATON AND RESEARCH

Annexure - III

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Sri Lakshmi Narayana Institute of Medical Sciences, Pondicherry

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c. Fibrous Pericarditis

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Akshara. S
URH19022203

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Annexure - III

Assessment Form

Sri Lakshmi Narayana Institute of Medical Sciences, Pondicherry

Course code: VAC02/AHS/2019-16/09

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Sri Lakshmi Narayana Institute of Medical Sciences

Affiliated to Bharath Institute of Higher Education & Research

(Deemed to be University under section 3 of the UGC Act 1956)

CERTIFICATE OF MERIT

This is to certify that **JANANI M (UAH1902217)** has actively participated in the Value Added Course on **Pericardiocentesis**(VAC02/AHS/2019-16/09) held during month Organized by Sri Lakshmi Narayana Institute of Medical Sciences, Pondicherry- 605 502, India.

RESOURCE PERSON

Dr. G.Somasundram

COORDINATOR

Sri Lakshmi Narayana Institute of Medical Sciences

Affiliated to Bharath Institute of Higher Education & Research

(Deemed to be University under section 3 of the UGC Act 1956)

CERTIFICATE OF MERIT

This is to certify that **GETZI R(UAH1902210)** has actively participated in the Value Added Course on **Pericardiocentesis**(VAC02/AHS/2019-16/09) held during month Organized by Sri Lakshmi Narayana Institute of Medical Sciences, Pondicherry- 605 502, India.

RESOURCE PERSON

Dr. G.Somasundram

COORDINATOR

5Annexure- V

Student Feedback Form

Course Name: Pericardiocentesis

Subject Code: VAC02/AHS/2019-16/09

Name of Student: _____Roll No.:

We are constantly looking to improve our classes and deliver the best training to you. Your evaluations, comments and suggestions will help us to improve our performance

Feedback Form

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
1. The course met my expectations.	○	○	○	○	○
2. I will be able to apply the knowledge learned.	○	○	○	○	○
3. The course objectives for each topic were identified and followed.	○	○	○	○	○
4. The content was organised and easy to follow.	○	○	○	○	○
5. The quality of instruction was good.	○	○	○	○	○
6. Class participation and interaction were encouraged.	○	○	○	○	○
7. Adequate time was provided for questions and discussion.	○	○	○	○	○

8. How do you rate the course overall?
   - ○ Excellent
   - ○ Good
   - ○ Average
   - ○ Poor
   - ○ Very poor

9. The aspects of the course could be improved?

10. Other comments?

Signature of the student:
Date:

5Annexure- V

Student Feedback Form

Course Name: Pericardiocentesis

Subject Code: VAC02/AHS/2019-16/09

Name of Student: ASWIN S Roll No.: 180190220S

We are constantly looking to improve our classes and deliver the best training to you. Your evaluations, comments and suggestions will help us to improve our performance

Feedback Form

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
1. The course met my expectations.	✓	○	○	○	○
2. I will be able to apply the knowledge learned.	○	✓	○	○	○
3. The course objectives for each topic were identified and followed.	✓	○	○	○	○
4. The content was organised and easy to follow.	○	✓	○	○	○
5. The quality of instruction was good.	✓	○	○	○	○
6. Class participation and interaction were encouraged.	✓	○	○	○	○
7. Adequate time was provided for questions and discussion.	✓	○	○	○	○

8. How do you rate the course overall?
   - ✓ Excellent
   - ○ Good
   - ○ Average
   - ○ Poor
   - ○ Very poor

9. The aspects of the course could be improved?

10. Other comments? No
The class was good.

Signature of the student: Aswin.

Date: 12/9/19

5Annexure- V

Student Feedback Form

Course Name: **Pericardiocentesis**

Subject Code: VAC02/AHS/2019-16/09

Name of Student: Geetya Roll No.: DAH190222

We are constantly looking to improve our classes and deliver the best training to you. Your evaluations, comments and suggestions will help us to improve our performance

Feedback Form

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
1. The course met my expectations.	✓	○	○	○	○
2. I will be able to apply the knowledge learned.	○	✓	○	○	○
3. The course objectives for each topic were identified and followed.	✓	○	○	○	○
4. The content was organised and easy to follow.	✓	○	○	○	○
5. The quality of instruction was good.	○	✓	○	○	○
6. Class participation and interaction were encouraged.	○	✓	○	○	○
7. Adequate time was provided for questions and discussion.	✓	○	○	○	○

8. How do you rate the course overall?
   - ○ ✓ Excellent
   - ○ Good
   - ○ Average
   - ○ Poor
   - ○ Very poor

9. The aspects of the course could be improved?

10. Other comments? NO

The way of teaching was good.

Signature of the student:
Date: 12/9/19

Date: 15.09.2017

From

Dr.G.Somasundram
Department of Pharmacology,
Sri Lakshmi Narayana Institute of Medical Sciences
Bharath Institute of Higher Education and Research,
Chennai.

Through Proper Channel

To

The Dean,
Sri Lakshmi Narayana Institute of Medical Sciences
Bharath Institute of Higher Education and Research,
Chennai.

Sub: Completion of value-added course: Pericardiocentesis

Dear Sir,

With reference to the subject mentioned above, the department has conducted the value-added course titled: "**Pericardiocentesis"** September to October 2019 for 30 AHS Students. We solicit your kind action to send certificates for the participants that is attached with this letter. Also, I am attaching the photographs captured during the conduct of the course.

Kind Regards,

Dr.G.Somasundram

Encl: Certificates

Photographs

Sri Lakshmi Narayana Institute of Medical Sciences

Date: 14-09-2019

From

Dr.G.Somasundram
Principal of Allied Health Sciences,
Sri Lakshmi Narayana Institute of Medical Sciences
Bharath Institute of Higher Education and Research,
Chennai.

To

The Dean,
Sri Lakshmi Narayana Institute of Medical College
Bharath Institute of Higher Education and Research,
Chennai.

Sub: Permission to conduct value-added course: antihistamines

Dear Sir,

With reference to the subject mentioned above, the department proposes to conduct a value-added course titled: **Antihistamines** from October to November 2019. We solicit your kind permission for the same.

Kind Regards

Dr.G.Somasundram

FOR THE USE OF DEANS OFFICE

Names of Committee members for evaluating the course:

The Dean: **Dr. Jayalakshmi**

The HOD: **Dr. Somasundram. G**

The Expert: **Dr. Antony**

The committee has discussed about the course and is approved.

Dean	Subject Expert	HOD
(Sign & Seal)	(Sign & Seal)	(Sign & Seal)

Dr. G. JAYALAKSHMI, BSC., MBBS., DTCD., M.D.,
DEAN
Sri Lakshmi Narayana Institute of Medical Sciences
Osudu, Agaram, Kudapakkam Post,
Villianur Commune, Puducherry - 605502.

PRINCIPAL
Allied Health Sciences
Sri Lakshmi Narayana Institute of Allied Health Sciences
Osudu, Agaram Post, Puducherry - 605 502.

OFFICE OF THE DEAN

Sri Lakshmi Narayana Institute of Medical Sciences

OSUDU, AGARAM VILLAGE, VILLIANUR COMMUNE, KUDAPAKKAM POST,
PUDUCHERRY - 605 502.
[Recognised by Medical Council of India, Ministry of Health letter No. U/12012/249/2005-ME (P -II) dt. 11/07/2011]
[Affliated to Bharath University, Chennai - TN]

Circular

29.09.2019

Sub: Organizing Value-added Course: "Antihistamines ".reg

With reference to the above-mentioned subject, it is to bring to your notice that Sri Lakshmi Narayana Institute of Medical Sciences, **Bharath Institute of Higher Education and Research** is organizing **"Antihistamines"**. The course content and registration form is enclosed below."

The application must reach the institution along with all the necessary documents as mentioned. The hard copy of the application should be sent to the institution by registered/ speed post only so as to reach on or before October to November 2019. Applications received after the mentioned date shall not be entertained under any circumstances.

Dean

Dr. G. JAYALAKSHMI, BSC., MBBS., DTCD., M.D.,
DEAN
Sri Lakshmi Narayana Institute of Medical Sciences
Osudu, Agaram, Kudapakkam Post,
Villianur Commune, Puducherry - 605502.

Encl: Copy of Course content

VALUE ADDED COURSE

1. Name of the programme & Code

"Antihistamines" & VAC/AHS/2019-14/10

2. Duration & Period

30 hrs. & October to November 2019

3. Information Brochure and Course Content of Value-Added Courses

Enclosed as Annexure- I

4. List of students enrolled

Enclosed as Annexure- II

5. Assessment procedures:

Assessment - *Enclosed as Annexure- III*

6. Certificate model

Enclosed as Annexure- IV

7. No. of times offered during the same year:

1 time October to November 2019

8. Year of discontinuation: 2020

9. Summary report of each program year-wise

Value Added Course- October to November 2019					
Sl. No	**Course Code**	**Course Name**	**Resource Persons**	**Target Students**	**Strength & Year**
1	**VAC03/AHS/2019-14/10**	Antihistamines	Dr. Antony	AHS	21 students October to November 2019

10. Course Feed Back

Enclosed as Annexure- V

RESOURCE PERSON

COORDINATOR
Dr.G.Somasundram

PRINCIPAL
Allied Health Sciences
Sri Lakshmi Narayana Institute of Allied Health Sciences
Osudu, Agaram Post, Puducherry - 605 502.

Course Proposal

Course Title: "**Antihistamines"**

Course Objective:

1. To enhance the performance skill in antihistamines.
2. To assess the objectives and protocols in antihistamines.
3. To assess the reaction of target allied Health students towards the antihistamines by getting their feedback.

Course Outcome: Improvement in the "Antihistamines"
Course Audience: Students of AHS Batch 2019
Course Coordinator: Dr.G.Somasundram
Course Faculties with Qualification and Designation:

1. Dr. Antony

Course Curriculum/Topics with schedule (Min of 30 hours)

SlNo	Date	Topic	Time	Hours
1.	14.10.2019	Introduction to antihistamines, Background, Objectives,	4-6p.m	2
2.	16.10.2019	What are allergies	2-4p.m	2
3.	18.10.2019	Introduction to allergies	4-6p.m	2
4.	19.10.2019	Substances or allergen's that cause allergies	4-6p.m	2
5.	21.10.2019	Symptoms of histamine	4-6p.m	2
6.	23.10.2019	Classification of antihistamines	4-6p.m	2
7.	24.10.2019	conventional didactic lecture and video	4-6P.M	2
8.	26.10.2019	Difference between second & first generation	4-6p.m	2
9.	28.10.2019	H1 first generation antihistamines	4-6p.m	2
10.	30.10.2019	H2 generation antihistamines	4-6p.m	2
11.	01.11.2019	Side effects of antihistamine	4-6p.m	2
12.	04.11.2019	Forms of antihistamines	4-6p.m	2
13.	05.11.2019	Pre course and Post Course evaluation, Feedback analysis from Likert scale	2-4p.m	2
13.	06.11.2019	Steps model explanation and various performance assessment methods	4-6p.m	2
14.	08.11.2019	Orientation of the students about the training program and assessment	2-4p.m	2
		Total		30 hrs

REFERENCE BOOKS:

1. Leslie G Grammer & Paul a Greenberg, Patterson's Allergic Diseases.
2. Ekaterini Tiligada & Madeleine Ennis, Histamine Receptors as Drug Target
3. Kevin Parker, a Clinical Guide to Allergic Diseases

Antihistamines

- Antihistamines are a class of drugs commonly used to treat symptoms of allergies.
- These drugs help treat conditions caused by too much histamine; a chemical created by your body's immune system.
- Antihistamines are a class of drugs commonly used to treat symptoms of pollen and other allergens. They are also used to treat a variety of other conditions such as stomach problems, colds, anxiety and more.

What are allergies?

- Your body protects you from many threats. Your ribs protect your heart and lungs from injury.
- Your skin protects your body from outside elements like sun, wind and bacteria that can cause disease and infections. Your eyelashes protect your eyes from debris.
- And your body's internal protection system – your immune system – battles substances that enter your body that are deemed "foreign."
- An allergy occurs when your immune system overreacts to the "foreign" substance.
- In the case of an allergy, substances that are usually harmless and don't bother some people, such as dust or animal dander, do bother you! Your body views these substances as "foreign," which then triggers an overreaction by your body's defense system that includes the release of histamine.
- The substances that trigger the overreaction are called allergens. The symptoms that result are called an allergic reaction.
- Allergies are one of the most common chronic conditions in the world. Some 40 million to 50 million people in the United States have them.

- **What is histamine?**

- Histamine is an important chemical that has a role in a number of different bodily processes.
- It stimulates gastric acid secretion, plays a role in inflammation, dilates blood vessels, affects muscle contractions in the intestines and lungs and affects your heart rate.
- It also helps transmit messages between nerve cells and helps fluids move through blood vessel walls. Histamine is also released if your body encounters a threat from an allergen.
- Histamine causes vessels to swell and dilate, leading to allergy symptoms.

What are some of the substances, or allergens, that cause allergies?

The top eight most common things that can cause an allergic reaction in some people include:

- Food.
- Dust.
- Pollen.
- Pet dander, saliva or urine.
- Mold.
- Insect bites and stings.
- Latex.
- Certain medications/drugs.

What allergic symptoms do histamines cause?

Too much histamine, caused by your body being oversensitive and overreacting to an allergen, causes a variety of symptoms. Symptoms include:

- Congestion, coughing.
- Wheezing, shortness of breath.
- Tiredness (fatigue).
- Itchy skin, hives and other skin rashes.
- Itchy, red, watering eyes.
- A running or blocked nose, or sneezing.
- Insomnia.

What are antihistamines?

An antihistamine is a prescription or over-the-counter medication that blocks some of what histamine does. “Anti” means against, so antihistamines are medicines that work against or block histamine.

How are antihistamines classified?

- Antihistamines are divided into two major subtypes. The first subtype is called H-1 receptor antagonists or H-1 blockers.
- This subtype of antihistamines is used to treat allergy symptoms. The second subtype is called H-2 receptor antagonists or H-2 blockers.
- They are used to treat gastrointestinal conditions, including gastroesophageal reflux disease [GERD] (also called acid reflux), peptic ulcers, gastritis, motion sickness, nausea and vomiting.
- The naming structure (H-1 and H-2) tells doctors and scientists the cell type the location of the histamine receptor that the antihistamine medication blocks.

- The H-1 blocker subtype is further broken down into two groups — first-generation antihistamines and second-generation antihistamines.

What’s the difference between first- and second-generation antihistamines?

- Just like the name implies, the first-generation antihistamine were the first type approved by the Food and Drug Administration (FDA).
- They began to be approved in the United States in the 1930s and are still prescribed today.
- They work on histamine receptor in the brain and spinal cord along with other types of receptors.
- Most notable about this generation of antihistamines is that they cross the blood-brain barrier, which results in drowsiness.
- Second-generation antihistamines were approved by the FDA and first came to market in the 1980s.
- The second-generation antihistamines do not cross the blood-brain barrier to the extent that first-generation do and therefore do not cause drowsiness at standard dosage levels.
- Second-generation antihistamines are considered to be safer than first generation antihistamines because they don't cause drowsiness and interact with fewer drugs.

What are some examples of H-1 first- and second-generation antihistamines and H-2 blockers?

There are many prescription and over-the-counter H-1 antihistamines. If you have allergies, you're likely taking a H-1 antihistamine. A few examples of first-generation over-the-counter and prescription H-1 blockers include:

- Brompheniramine (Children's Dimetapp Cold®).
- Chlorpheniramine (Chlor-Trimeton®).
- Clemastine (Dayhist®).
- Cyproheptadine (Periactin®).
- Dexchlorpheniramine Dimenhydrinate (Dramamine®).
- Diphenhydramine (Benadryl®).
- Doxylamine (Vicks NyQuil®, Tylenol Cold and Couth Nighttime®).

- Hydroxyzine (Vistaril®).
- Phenindamine (Nolahist®).

A few examples of second-generation over-the-counter and prescription H-1 blockers include:

- Azelastine (Astelin®).
- Loratadine (Claritin®).
- Cetirizine (Zyrtec®).
- Desloratadine (Clarinex®).
- Fexofenadine (Allegra®).

If you're taking an antihistamine to help with stomach issues, you're likely taking a H-2 antihistamine. A few examples of H-2 antihistamines include:

- Cimetidine (Tagamet HB®).
- Famotidine (Pepcid®).
- Nizatidine (Axid®).
- Ranitidine (Zantac®).

Besides allergies, what other medical conditions do antihistamines treat?

H-1 antihistamines treat:

- Allergic rhinitis/hay fever.
- Allergic conjunctivitis.
- Hives and other skin rashes.
- Colds.
- Food allergies.
- Hypersensitivity to certain drugs.
- Insect bites and stings.

First-generation H-1 antihistamines also treat:

- Insomnia.
- Motion sickness.
- Anxiety.

H-2 antihistamines treat:

- Heartburn.
- Gastroeophageal reflux disease (GERD).
- Duodenal and gastric ulcers.
- Zollinger-Ellison syndrome.

Other conditions antihistamines treat include:

- Anorexia.
- Headaches.
- Anaphylaxis.
- Vertigo.
- Parkinson's disease (to decrease stiffness and tremors).
- Some types of bone pain.

Your healthcare provider may prescribe antihistamines for even other conditions.

What are the side effects of antihistamines?

You and your healthcare provider should discuss specific antihistamines and decide together if the potential benefits of an antihistamine outweigh its potential side effects.

Some of the common side effects of first-generation antihistamines include:

- Drowsiness.

- Dry mouth, dry eyes.
- Blurred or double vision.
- Dizziness and headache.
- Low blood pressure.
- Mucous thickening in the airways.
- Rapid heart rate.
- Difficulty urinating and constipation.

Some of the common side effects of second-generation antihistamines include:

- Headache.
- Cough.
- Tiredness.
- Sore throat.
- Abdominal pain or discomfort
- Nausea or vomiting.

Common side effects of H-2 antihistamines include:

- Drowsiness.
- Joint or muscle pain.
- Headache.
- Confusion in the elderly.
- Dizziness.
- Breast swelling and tenderness.

what dosage forms are antihistamines available?

Antihistamines come in several forms including:

- Liquids.
- Lotions.
- Syrups.
- Gels.
- Eye drops.
- Tablets.
- Nasal sprays.
- Creams.
- Capsules.
- Suppositories

How do I know which antihistamine to take?

- If you need a prescription antihistamine, you and your healthcare provider will work together to figure out what medication will be best for you. Many drugs interact with antihistamines, so your healthcare provider will want to know what medical conditions you have and medications you are currently taking.
- They will also want to know if you are pregnant, plan to become pregnant or are breastfeeding.
- Some antihistamines are not recommended in pregnancy because they may cause birth defects in very high doses. Antihistamines can pass into breast milk, so you should consult with your healthcare provider before using antihistamines if you are breastfeeding.
- Children and the elderly are more sensitive to the effects of antihistamines, so special consideration will be given to the use of these products in these patients.
- Never give over-the-counter cough and cold antihistamines to children under four years of age.

These medications can cause life-threatening side effects.

Can antihistamines cause fever?

Fever is not one of the side effects of antihistamines.

Can antihistamines cause constipation?

Yes, some antihistamines, such as diphenhydramine, do cause constipation as a side effect.

Can antihistamines cause dizziness?

Yes. Dizziness is a common side effect of some antihistamines.

Can antihistamines cause depression?

One study of 92 people with chronic itchiness saw that patients who took the antihistamines cetirizine and hydroxyzine reported an increase in depression and anxiety. The effects of all antihistamines on mood disorders have yet to be studied.

Can antihistamines cause high blood pressure?

If you're already taking medication for high blood pressure, combining that with an antihistamine can increase your heart rate and raise your blood pressure. Talk to your healthcare provider about your options.

Can antihistamines cause weight gain?

Antihistamines can cause you to gain weight, yes. One antihistamine, cyproheptadine, is used for that reason. Histamine is known to reduce your appetite, so antihistamines cancel that out.

What antihistamines can you take together?

Antihistamines should not be combined unless directed to do so by your healthcare provider under their guidance and supervision. Antihistamines should be used only as directed or you could experience serious side effects. Read labels very carefully.

What should I do if antihistamines don't work?

Talk to your regular healthcare provider, your pharmacist or get an allergist to help you find ways to treat your allergies. Some allergies can be treated with decongestants or immunotherapy.

Can I take antihistamines if I'm pregnant or breastfeeding?

It's safest to talk to your healthcare provider if you are pregnant, planning to become pregnant or are breastfeeding. Animal studies have shown that some antihistamines can cause birth defects. Small amounts of antihistamines pass on to your baby if you breastfeed. For these reasons your healthcare provider will want to talk with you and make careful choices (or different choices) if there is any concern for your or your child's safety.

Are antihistamines safe for dogs?

Diphenhydramine is a common medication used to treat allergies, hives, food allergies, anxiety and other conditions in dogs. However, you should consult your veterinarian about the use of diphenhydramine in your pet. The dosage in dogs is based on their weight plus your veterinarian will want to examine your dog to be sure an antihistamine is the correct drug for the correct diagnosis. If an antihistamine is needed, your veterinarian will want to

prescribe a brand that is specific to animals and at a dosage correct for your pet.

Do antihistamines cause dementia?

Long term use of some antihistamines may increase your risk of dementia. Diphenhydramine (Benadryl®) blocks the effects of a neurotransmitter called acetylcholine. This neurotransmitter is vital for memory and learning. Diphenhydramine increased the risk of dementia by 54% in one 3,000 patient study followed for seven years.

What questions should I ask my healthcare provider?

- What type of antihistamine would work best for me?
- How do I proper take the prescribed antihistamine?
- What side effects might occur with the recommended medication?
- What antihistamine won't interfere with the current medications I am taking?
- When, or for what conditions, does taking an antihistamine that would make me drowsy make sense?
- Can I live my life normally while using this medication? Can I drive? Can I operate heavy machinery?
- Can I take antihistamines if I am pregnant, planning to become pregnancy or am breastfeeding?
- Can antihistamines be safely given to my child?
- What are the consequences if I don't take an antihistamine to help with my allergies?

A note from Cleveland Clinic

- Histamine is on your side. The chemical does its best to regulate help your heart and lungs and protect your body from foreign allergens, among other roles.
- But it can be oversensitive, and it can overreact, and that's where antihistamines can help.
- If you're have allergies, stomach symptoms or any of the other conditions and symptoms mentioned in this article, talk to your healthcare provider about your options. Your symptoms may be able to be treated.

Summary

- Most healthcare providers recommend using second- or third-generation antihistamines to treat mild to moderate allergy symptoms, including congestion, watery eyes, and itchy skin.
- People can still buy first-generation antihistamines. However, these forms can cause drowsiness and sedation.
- People can choose between a wide range of antihistamines in drugs stores and online.
- Parents and caregivers may want to consult a health care professional before giving an antihistamine to a child, especially if the child is 12 years old or younger.

Table. Commonly available antihistamines

Antihistamine	Generation and classification	Common trade names
Chlorpheniramine	First, sedating	Chlor-Trimeton
Brompheniramine	First, sedating	Dimetapp
Diphenhydramine	First, sedating	Benadryl
Cetirizine	Second, nonsedating	Zrytec
Levocetirizine	Second, nonsedating	Xyzal
Loratadine	Second, nonsedating	Claritin
Desloratadine	Second, nonsedating	Clarinex
Fexofenadine	Second, nonsedating	Allegra

SRI LAKSHMI NARAYANA INSTITUTE OF ALLIED HEALTH SCIENCE

MEDICAL EDUCATIONAL PROJECT

Antihistamine - VAC03/AHS/2019-14/10

SlNo.	Name of the Students	University Register Number	Signature
1	**PUNNYA PRAKASH**	**UAH1902233**	
2	**RAHUL A**	**UAH1902234**	
3	**RANGANAYAGI P**	**UAH1902235**	
4	**SABIR KS**	**UAH1902236**	
5	**SANJAY K**	**UAH1902237**	
6	**SARATH KRISHNAN R**	**UAH1902238**	
7	**SINDHU P**	**UAH1902240**	
8	**SREE BHAGYA V**	**UAH1902241**	
9	**SURIYA GAYATHIRI S**	**UAH1902242**	
10	**USHA RANI B**	**UAH1902243**	
11	**VENKADALAKSMI A**	**UAH1902244**	
12	**VIGNESHWARAN V**	**UAH1902245**	
13	**VISHNU PRIYA MADHU**	**UAH1902246**	
14	**VIVEDHA K**	**UAH1902247**	
15	**VYSHNAV KRISHNAN C**	**UAH1902248**	
16	**YUKESH S**	**UAH1902249**	
17	**HRIDHIK DINAKAR**	**UAH1907101**	
18	**MOHAMMED NIZHAMUDHEEN MV**	**UAH1907102**	
19	**MOHAMMEDNIHAD K M**	**UAH1907103**	
20	**NANDHU P. R**	**UAH1907104**	
21	**REEHANA U**	**UAH1907105**	

SRI LAKSHMI NARAYANA INSTITUTE OF ALLIED HEALTH SCIENCE

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9	SURIYA GAYATHIRI S	UAH1902242	
10	USHA RANI B	UAH1902243	
11	VENKADALAKSMI A	UAH1902244	
12	VIGNESHWARAN V	UAH1902245	
13	VISHNU PRIYA MADHU	UAH1902246	
14	VIVEDHA K	UAH1902247	
15	VYSHNAV KRISHNAN C	UAH1902248	
16	YUKESH S	UAH1902249	
17	HRIDHIK DINAKAR	UAH1907101	
18	MOHAMMED NIZHAMUDHEEN MV	UAH1907102	
19	MOHAMMEDNIHAD K M	UAH1907103	
20	NANDHU P. R	UAH1907104	
21	REEHANA U	UAH1907105	

SRI LAKSHMI NARAYANA INSTITUE OF HIGHER EDUCATON AND RESEARCH

Annexure - III

Assessment Form

Sri Lakshmi Narayana Institute of Medical Sciences, Pondicherry

Course code: VAC03/AHS/2019-14/10

Multiple Choice Question 10x2=20

1. Antihistamines are a class of drugs commonly used to treat symptoms of ……..
    a) **A**llergies
    b) Rashes
    c) Both a&b
    d) None of the above
2. An allergy occurs when your immune system overreacts to the ……substance.
    a) Pollen
    b) Foreign
    c) dust
    d) None of the above
3. ……..is an important chemical that has a role in a number of different bodily processes
    a) Antihistamine
    b) Histamine
    c) Heparin
    d) All of the above
4. An example for the allergic reaction
    a) Pollen
    b) Pollution
    c) Radiation
    d) None of the above
5. Identify the symptom of the histamines……
    a) Fever
    b) Dizziness
    c) Congestion & coughing
    d) Headache

6. An ……. is a prescription or over-the-counter medication that blocks some of what histamine does
    a) Antihistamines
    b) Histamines
    c) Both a &b
    d) None of the above
7. Examples for H1 receptors
    a) Chlorpheniramine
    b) Pheniramine
    c) Cyclophrenine
    d) None of the above
8. H1 receptors are used to treat……..
    e) Allergic conjunctivitis
    f) Fever
    g) Rashes
    h) None of the above
9. Example for H2 receptors……
    a) Ranitidine
    b) Ranitidine
    c) Chlorpheniramine
    d) Pheniramine
10. H-2 antihistamines treat
    a) Heart burn
    b) Heart attack
    c) Allergic conjunctivitis
    d) None of the above

SRI LAKSHMI NARAYANA INSTITUE OF HIGHER EDUCATON AND RESEARCH

SREE BHAGYA.
JAH19022241

SRI LAKSHMI NARAYANA INSTITUE OF HIGHER EDUCATON AND RESEARCH

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Assessment Form

Sri Lakshmi Narayana Institute of Medical Sciences, Pondicherry

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SRI LAKSHMI NARAYANA INSTITUE OF HIGHER EDUCATON AND RESEARCH

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SRI LAKSHMI NARAYANA INSTITUE OF HIGHER EDUCATON AND RESEARCH

REEHANA. O
UA U L90711105

SRI LAKSHMI NARAYANA INSTITUE OF HIGHER EDUCATON AND RESEARCH

Annexure - III

Assessment Form

Sri Lakshmi Narayana Institute of Medical Sciences, Pondicherry

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SRI LAKSHMI NARAYANA INSTITUE OF HIGHER EDUCATON AND RESEARCH

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Sri Lakshmi Narayana Institute of Medical Sciences

Affiliated to Bharath Institute of Higher Education & Research

(Deemed to be University under section 3 of the UGC Act 1956)

CERTIFICATE OF MERIT

This is to certify that **RAHUL A(UAH1902234)** has actively participated in the Value Added Course on **Antihistamines VAC03/AHS/2019-14/10** held October to November 2019 Organized by Sri Lakshmi Narayana Institute of Medical Sciences, Pondicherry- 605 502, India.

RESOURCE PERSON

Dr. G.Somasundram

COORDINATOR

Sri Lakshmi Narayana Institute of Medical Sciences

Affiliated to Bharath Institute of Higher Education & Research

(Deemed to be University under section 3 of the UGC Act 1956)

CERTIFICATE OF MERIT

This is to certify that **VIGNESHWARAN V(UAH1902245)** has actively participated in the Value Added Course on **Antihistamines VAC03/AHS/2019-14/10** held October to November 2019 Organized by Sri Lakshmi Narayana Institute of Medical Sciences, Pondicherry- 605 502, India.

RESOURCE PERSON

Dr. G.Somasundram

COORDINATOR

5Annexure- V

Student Feedback Form

Course Name: ANTIHISTAMINES

Subject Code: VAC03/AHS/2019-14/10

Name of Student: _____Roll No.:

We are constantly looking to improve our classes and deliver the best training to you. Your evaluations, comments and suggestions will help us to improve our performance

Feedback Form

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
1. The course met my expectations.	○	○	○	○	○
2. I will be able to apply the knowledge learned.	○	○	○	○	○
3. The course objectives for each topic were identified and followed.	○	○	○	○	○
4. The content was organised and easy to follow.	○	○	○	○	○
5. The quality of instruction was good.	○	○	○	○	○
6. Class participation and interaction were encouraged.	○	○	○	○	○
7. Adequate time was provided for questions and discussion.	○	○	○	○	○

8. How do you rate the course overall?
   - ○ Excellent
   - ○ Good
   - ○ Average
   - ○ Poor
   - ○ Very poor

9. The aspects of the course could be improved?

10. Other comments?

Signature of the student:
Date:

5Annexure- V

Student Feedback Form

Course Name: ANTIHISTAMINES

Subject Code: VAC03/AHS/2019-14/10

Name of Student: VIVEDHA A.K Roll No.: UAM19D2247

We are constantly looking to improve our classes and deliver the best training to you. Your evaluations, comments and suggestions will help us to improve our performance

Feedback Form

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
1. The course met my expectations.	✓	○	○	○	○
2. I will be able to apply the knowledge learned.	○	✓	○	○	○
3. The course objectives for each topic were identified and followed.	✓	○	○	○	○
4. The content was organised and easy to follow.	○	○	✓	○	○
5. The quality of instruction was good.	✓	○	○	○	○
6. Class participation and interaction were encouraged.	○	✓	○	○	○
7. Adequate time was provided for questions and discussion.	○	✓	○	○	○

8. How do you rate the course overall?
   - ✓ Excellent
   - Good
   - Average
   - Poor
   - Very poor

9. The aspects of the course could be improved? No

10. Other comments?
The was interesting

Signature of the student: Vivedha

Date: 8.11.2019

5Annexure- V

Student Feedback Form

Course Name: ANTIHISTAMINES

Subject Code: VAC03/AHS/2019-14/10

Name of Student: HRIDHIK DINAKAR Roll No.: UAH190710

We are constantly looking to improve our classes and deliver the best training to you. Your evaluations, comments and suggestions will help us to improve our performance

Feedback Form

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
1. The course met my expectations.	✓	o	o	o	o
2. I will be able to apply the knowledge learned.	o	✓	o	o	o
3. The course objectives for each topic were identified and followed.	✓	o	o	o	o
4. The content was organised and easy to follow.	o	o	✓	o	o
5. The quality of instruction was good.	✓	o	o	o	o
6. Class participation and interaction were encouraged.	o	✓	o	o	o
7. Adequate time was provided for questions and discussion.	o	✓	o	o	o

8. How do you rate the course overall?
   - o Excellent
   - ✓ Good
   - o Average
   - o Poor
   - o Very poor

9. The aspects of the course could be improved? NO

10. Other comments? The class was good and from the Pratical class we learnt a lot

Signature of the student: Hridhik

Date: 8.11.2019

Date: 10.11.2019

From

Dr.G.Somasundram
Department of Pharmacology,
Sri Lakshmi Narayana Institute of Medical Sciences
Bharath Institute of Higher Education and Research,
Chennai.

Through Proper Channel

To

The Dean,
Sri Lakshmi Narayana Institute of Medical Sciences
Bharath Institute of Higher Education and Research,
Chennai.

Sub: Completion of value-added course: Antihistamines

Dear Sir,

With reference to the subject mentioned above, the department has conducted the value-added course titled: **Antihistamines** from October to November 2019 for 21 AHS Students. We solicit your kind action to send certificates for the participants that is attached with this letter. Also, I am attaching the photographs captured during the conduct of the course.

Kind Regards,

Dr.G.Somasundram

Encl: Certificates

Photographs

Sri Lakshmi Narayana Institute of Medical Sciences

Date: 14.10.2019

From

Dr.G.Somasundram
Principal of Allied Health Sciences,
Sri Lakshmi Narayana Institute of Medical Sciences
Bharath Institute of Higher Education and Research,
Chennai.

To

The Dean,
Sri Lakshmi Narayana Institute of Medical College
Bharath Institute of Higher Education and Research,
Chennai.

Sub: Permission to conduct value-added course: "CLINICAL PAHARMACOLOGY"

Dear Sir,

With reference to the subject mentioned above, the department proposes to conduct a value-added course titled: **"CLINICAL PAHARMACOLOGY"** from. We solicit your kind permission for the same.

Kind Regards

Dr.G.Somasundram

FOR THE USE OF DEANS OFFICE

Names of Committee members for evaluating the course:

The Dean: **Dr. Balagurunathan. K**

The HOD: **Dr. Somasundram. G**

The Expert: **Dr. Sumitra**

The committee has discussed about the course and is approved.

Dean	Subject Expert	HOD
(Sign & Seal)	(Sign & Seal)	(Sign & Seal)

DEAN
Prof.K.BALAGURUNATHAN,M.S
(General surgeon)
SRI LAKSHMI NARAYANA
INSTITUTE OF MEDICAL SCIENCES
OSUDU PONDICHERRY

PRINCIPAL
Allied Health Sciences
Sri Lakshmi Narayana Institute of Allied Health Sciences
Osudu, Agaram Post, Puducherry - 605 502.

OFFICE OF THE DEAN

Sri Lakshmi Narayana Institute of Medical Sciences

OSUDU, AGARAM VILLAGE, VILLIANUR COMMUNE, KUDAPAKKAM POST,
PUDUCHERRY - 605 502.
[Recognised by Medical Council of India, Ministry of Health letter No. U/12012/249/2005-ME (P -II) dt. 11/07/2011]
[Affliated to Bharath University, Chennai - TN]

Circular

04.11.2019

Sub: Organizing Value-added Course: "CLINICAL PAHARMACOLOGY".**reg**

With reference to the above mentioned subject, it is to bring to your notice that Sri Lakshmi Narayana Institute of Medical Sciences, **Bharath Institute of Higher Education and Research** is organizing **"CLINICAL PAHARMACOLOGY"**. The course content and registration form is enclosed below."

The application must reach the institution along with all the necessary documents as mentioned. The hard copy of the application should be sent to the institution by registered/ speed post only so as to reach on or before November to December 2019. Applications received after the mentioned date shall not be entertained under any circumstances.

Dean

DEAN
Prof.K.BALAGURUNATHAN,M.S
(General surgeon)
SRI LAKSHMI NARAYANA
INSTITUTE OF MEDICAL SCIENCES
OSUDU PONDICHERRY

Encl: Copy of Course content

VALUE ADDED COURSE

1. Name of the programme & Code

"CLINICAL PAHARMACOLOGY" & VAC04/AHS/2019-18/11

2. Duration & Period

30 hrs. & November to December 2019

3. Information Brochure and Course Content of Value-Added Courses

Enclosed as Annexure- I

4. List of students enrolled

Enclosed as Annexure- II

5. Assessment procedures:

Assessment - *Enclosed as Annexure- III*

6. Certificate model

Enclosed as Annexure- IV

7. No. of times offered during the same year:

1-time November to December 2019

8. Year of discontinuation: 2020

9. Summary report of each program year-wise

Value Added Course- November to December 2019					
Sl. No	**Course Code**	**Course Name**	**Resource Persons**	**Target Students**	**Strength & Year**
1	VAC04/AHS/2019-18/11	**"CLINICAL PAHARMACOLOGY"**	**Dr. Sumitra**	AHS	30 students October to December 2019

10. Course Feed Back

Enclosed as Annexure- V

RESOURCE PERSON

COORDINATOR
Dr. G Somasundaram

PRINCIPAL
Allied Health Sciences
Sri Lakshmi Narayana Institute of Allied Health Sciences
Osudu, Agaram Post, Puducherry - 605 502.

Course Proposal

Course Title: "**CLINICAL PHARMCOLOGY"**

Course Objective:

1. To enhance the performance skill in Clinical Pharmacology.
2. To assess the objectives and protocols in Clinical Pharmacology.
3. To assess the reaction of target allied Health students towards the Clinical Pharmacology by getting their feedback.

Course Outcome: Improvement in the "CLINICAL PHARMCOLOGY"
Course Audience: Students of AHS Batch 2019
Course Coordinator: Dr. G. Somasundaram
Course Faculties with Qualification and Designation:
1.Dr. Sumitra
Course Curriculum/Topics with schedule (Min of 30 hours)

SlNo	Date	Topic	Time	Hours
1.	18.11.2019	Introduction to Clinical pharmacology	4-5p.m	1
2.	19.11.2019	Principles Clinical pharmacology	2-3p.m	1
3.	20.11.2019	Pharmacodynamics	4-5p.m	1
4.	21.11.2019	Pharmacokinetics	4-5p.m	1
5.	22.11.2019	Routes of drug administration	4-5p.m	1
6.	23.11.2019	Advantages of oral route and Disadvantages of oral route	4-5p.m	1
7.	25.11.2019	Bioavailability	4-5P.M	1
8.	26.11.2019	Factors affecting drug absorption and bioavailability	4-5p.m	1
9.	27.11.2019	Distribution of drugs and Factors determining the rate of distribution of drugs	4-5p.m	1
10.	28.11.2019	Plasma concentration of drug (PC)	4-5p.m	1
11.	29.11.2019	metabolism of drugs and Enzymes responsible for metabolism of drugs	4-5p.m	2
12.	30.11.2019	Excretion of drugs and Different routes of drug excretion	4-5p.m	1
13.	02.12.2019	Drug safety and effectiveness	2-3p.m	1
14.	03.12.2019	Factors modifying the dosage and action of drugs	4-5p.m	1
15.	04.12.2019	Acetylation and hydroxylation of drugs	4-5p.m	1
16.	05.12.2019	Pharmaceutical drug interactions and	3-5p.m	2

		Pharmacokinetic drug interactions		
17.	06.12.2019	Interactions during biotransformation	3-5p.m	2
18.	07.12.2019	Enzyme inhibitors: Disulfiram, isoniazid, allopurinol, cimetidine, etc.	4-5p.m	1
19.	09.12.2019	Drug tolerance, Emotional factors, Adverse drug reactions	4-5p.m	1
20.	10.12.2019	Side effects are intact pharmacological effects	3-5p.m	2
21.	11.12.2019	Untoward effects and Allergic reactions	4-5p.m	1
22.	12.12.2019	Development and evaluation of new drugs	4-5p.m	1
23.	13.12.2019	Assessment procedure and giving feedback in weaker areas	1-5p.m	4
		Total		30hrs

REFERENCE BOOKS:

1. Aronson JK. A manifesto for clinical pharmacology from principles to practice. Br J Clin Pharmacol 2010; 70: 3–13.
2. Martin, Jennifer H., David Henry, Jean Gray, Richard Day, Felix Bochner, Albert Ferro, Munir Pirmohamed, Klaus Mörike, and Matthias Schwab. "Achieving the World Health Organization's vision for clinical pharmacology." British journal of clinical pharmacology 81, no. 2 (2016): 223-227.
3. https://ascpt.onlinelibrary.wiley.com/hub/journal/15326535/aims-and-scope/read-full-aims-and-scope
4. *Atkinson, Arthur (2012). Principles of clinical pharmacology. London: Elsevier Academic Press. ISBN 978-0123854711.*
5. *Ambrose, Paul G (January 2007). Pharmacokinetics-Pharmacodynamics of Antimicrobial Therapy, Clinical Infectious Diseases, Volume 44, Issue 1.*

"CLINICAL PHARMACOLOGY"

What is Clinical Pharmacology?

Clinical pharmacology is the study of drugs in humans.

It is underpinned by the basic science of pharmacology, with added focus on the application of pharmacological principles and methods in the real world. It has a broad scope, from the discovery of new target molecules, to the effects of drug usage in whole populations.

Clinical pharmacologists are physicians, pharmacists, and scientists whose focus is developing and understanding new drug therapies. Clinical pharmacologists work in a variety of settings in academia, industry and government. In the laboratory setting they study biomarkers, pharmacokinetics, drug metabolism and genetics. In the office setting they design and evaluate clinical trials, create and implement regulation guidelines for drug use, and look at drug utilization on local and global scales. In the clinical setting they work directly with patients, participate in experimental studies, and investigate adverse reactions and interactions.

Clinical Pharmacology, in theory, has been practiced for centuries through observing the effects of herbal remedies and early drugs on humans. Most of this work was done through trial and error. In the early 1900s, scientific advances allowed scientists to combine the study of physiological effects with biological effects. This led to the first major breakthrough when scientists used clinical pharmacology to discover insulin. Since that discovery clinical pharmacology has expanded to be a multidisciplinary field and has contributed to the understanding of drug interaction, therapeutic efficacy and safety in humans. Over time clinical pharmacologists have been able to make more exact measurements and personalize drug therapies.

Part 2 Aspects of therapeutics

Introduction to Pharmacology

A. Definitions:

1. **Pharmacology**: Pharmacology is the study of interaction of drugs with living organisms. It also includes history, source, physicochemical properties, dosage forms, and methods of Administration, absorption, distribution mechanism of action, biotransformation, Excretion, clinical uses and adverse effects of drugs.
2. **Clinical Pharmacology**: It evaluate the pharmacological action of drug preferred route of administration and safe dosage range in human by clinical trails.
3. **Drugs:** Drugs are chemicals that alter functions of living organisms. Drugs are generally given for the diagnosis, prevention, control or cure of disease.
4. **Pharmacy:** It is the science of identification, selection, preservation, standardization, Compounding and dispensing of medical substances.
5. **Pharmacodynamics:** The study of the biological and therapeutic effects of drugs (i.e, "what the drug does to the body").
6. **Pharmacokinetics:** Study of the absorption, distribution metabolism and excretion (ADME) of drugs ("i.e what the body does to the drug").
7. **Pharmacotherapeutics**: It deals with the proper selection and use of drugs for the Prevention and treatment of disease.
8. **Toxicology:** It's the science of poisons. Many drugs in larger doses may act as poisons. Poisons are substances that cause harmful, dangerous or fatal symptoms in living Substances.

9. **Chemotherapy:** It's the effect of drugs upon microorganisms, parasites and neoplastic Cells living and multiplying in living organisms.
10. **Pharmacopoeia**: An official code containing a selected list of the established drugs and Medical preparations with descriptions of their physical properties and tests for their Identity, purity and potency e.g. Indian Pharmacopoeia (I.P), British Pharmacopoeia (B.P).

B. Drugs are obtained from:

1. Minerals: Liquid paraffin, magnesium sulfate, magnesium trisilicate, kaolin, etc.
2. Animals: Insulin, thyroid extract, heparin and antitoxin sera, etc.
3. Plants: Morphine, digoxin, atropine, castor oil, etc.
4. Synthetic source: Aspirin, sulphonamides, paracetamol, zidovudine, etc.
5. Micro organisms: Penicillin, streptomycin and many other antibiotics.
6. Genetic engineering: Human insulin, human growth hormone etc.

Out of all the above sources, majority of the drugs currently used in therapeutics are from Synthetic source.

Principles of clinical Pharmacology

1. Pharmacodynamics and pharmacokinetics

2 Clinical trials and drug developments

Pharmacodynamics

Involves how the drugs act on target cells to alter cellular function.

A. Receptor and non-receptor mechanisms: Most of the drugs act by interacting with a

Cellular component called receptor. Some drugs act through simple physical or chemical

Reactions without interacting with any receptor.

• Receptors are protein molecules present either on the cell surface or with in the cell

E.g. adrenergic receptors, cholinoceptors, insulin receptors, etc.

• The endogenous neurotransmitters, hormones, autacoids and most of the drugs

Produce their effects by binding with their specific receptors.

• Aluminium hydroxide and magnesium trisilicate, which are used in the treatment of

Peptic ulcer disease act by non-receptor mechanism by neutralizing the gastric acid.

Many drugs are similar to or have similar chemical groups to the naturally occurring chemical

And have the ability to bind onto a receptor where one of two things can happen- either the

Receptor will respond or it will be blocked.

A drug, which is able to fit onto a receptor, is said to have affinity for that receptor. Efficacy is

The ability of a drug to produce an effect at a receptor. An agonist has both an affinity and

Efficacy whereas antagonist has affinity but not efficacy or intrinsic activity.

When a drug is able to stimulate a receptor, it is known as an agonist and therefore mimics the

Endogenous transmitter.

When the drug blocks a receptor, it is known as antagonist and therefore blocks the action of

The endogenous transmitter (i.e. it will prevent the natural chemical from acting on the receptor).

However, as most drug binding is reversible, there will be competition between the drug and the

Natural stimulus to the receptor.

The forces that attract the drug to its receptor are termed chemical bonds and they are (a)

Hydrogen bond (b) ionic bond (c) covalent bond (d) Vander walls force. Covalent bond is the

Strongest bond and the drug-receptor complex is usually irreversible.

K1 K3

DR Biological effect

D+R K2

Where D = Drug, R= receptor DR= Drug receptor complex (affinity)

K1 = association constant

K2 = dissociation constant

K3 = intrinsic activity

When first messengers like neurotransmitters, hormones, autacoids and most of drugs bind with

Their specific receptors, the drug receptor complex is formed which subsequently causes the synthesis and release of another intracellular regulatory molecule termed as second messengers e.g. cyclic AMP, calcium, cyclic GMP, inositol triphosphate (IP3), diacylglycerol and calmodulin which in turn produce subcellular or molecular mechanism of drug action.

B. Site of drug action:

- A drug may act:

(I) intracellular e.g.: osmotic diuretics, plasma expanders.

(ii) On the cell surface e.g.: digitalis, penicillin, catecholamines

(iii) Inside the cell e.g.: anti-cancer drugs, steroid hormones.

C. Dose Response relationship

The exact relationship between the dose and the response depends on the biological object under observation and the drug employed.

When a logarithm of dose as abscissa and responses as ordinate are constructed graphically, the “S” shaped or sigmoid type curve is obtained.

The lowest concentration of a drug that elicits a response is minimal dose, and the largest concentration after which further increase in concentration will not change the response is the maximal dose.

1. **Graded dose effect:**
   As the dose administered to a single subject or tissue increases, the Pharmacological response also increases in graded fashion up to ceiling effect.
   - It is used for characterization of the action of drugs. The concentration that is required to Produce 50 % of the maximum effect is termed as EC50 or ED50.
2. **Quantal dose effect:**
   - It is all or none response, the sensitive objects give response to small Doses of a drug while some will be resistant and need very large doses. The quantal doseeffect curve is often characterized by stating the median effective dose and the median lethal dose.

Median lethal dose or LD50:

This is the dose (mg/kg), which would be expected to kill one Half of a population of the same species and strain.

Median effective dose or ED50:

This is the dose (mg/kg), which produces a desired Response in 50 per cent of test population.

Therapeutic index:

It is an approximate assessment of the safety of the drug. It is the ratio of the median lethal dose and the median effective dose. Also called as therapeutic window

Or safety.

The larger the therapeutic index, the safer is the drug. Penicillin has a very high therapeutic Index, while it is much smaller for the digitalis preparation.

D. Structural activity relationship

The activity of a drug is intimately related to its chemical structure. Knowledge about the Chemical structure of a drug is useful for:

(i) Synthesis of new compounds with more specific actions and fewer adverse Reactions

(ii) Synthesis of competitive antagonist and

(iii) Understanding the mechanism of drug action.

Slight modification of structure of the compound can change the effect completely.

PHARMACOKINETICS

Pharmacokinetics deals with the absorption, distribution, metabolism and excretion drugs in the body.

A. **Biotransport of drug:** It is translocation of a solute from one side of the biological barrier to the other.

1. Structure of biological membrane:

The outer surface of the cell covered by a very thin structure known as plasma membrane. It is composmembrane proteins have many functions like (a) contributing structure to the membrane (b) acting as enzyme (c) acting as carrier for transport of substances (d) acting as receptors. The

plasma membrane is a semipermeable membrane allowing certain chemical substances to pass freely e.g. it allows water, glucose, etc. but it won't allow sucrose until it is converted into glucose and fructoseis converted into glucose and fructose.

2. Passage of drug across membrane:

(a) Passive transfer

I) Simple diffusion

ii) Filtration

(b) Specialized transport

I) Facilitated diffusion

ii) Active transport

iii) Endocytosis.

(a) I) Simple diffusion:

Movement of a solute through a biological barrier from the phase of higher concentration to phase of lower concentration. No need of energy e.g. highly Lipid soluble drugs

ii) Filtration:

Is the process by which water soluble drug of relatively low molecular weight crosses the plasma membrane through pores as a result of hydrodynamic pressure gradient across the membrane e.g. urea and ethylene glycol.

(b) I) Facilitated diffusion:

It means the passage of drug across the biological membrane along the concentration gradient by the protein carrier mediated system also called as carrier mediated diffusion. It depends on number of carrier e.g. tetracycline, pyrimidine

ii) Active transport:

The process by which drugs pass across the biological membrane most often against their gradient with the help of carriers along with the expenditure of energy e.g. alpha methyl dopa, levodopa, 5-fluoro-uracil, 5 bromouracil.

iii) Endocytosis:

It is the process by which the large molecules are engulfed by the cell
Membrane and releases them intracellularly e.g. protein, toxins (botulinum, diphtheria)

Characteristics	**Simple diffusion**	**Facilitated**	**Active transport**
Incidence	Commonest	Less common	Least common

Process	Slow	Quick	Very quick
Movement	Along concentration gradient	Along concentration gradient	Against concentration gradient
Carrier	Not needed	Needed	Needed
Energy	Not needed	Not required	Required

B. **Drug absorption**:

Absorption is the process by which the drug enters in to the systemic Circulation from the site of administration through biological barrier. In case of intravenous or Intra-arterial administration the drug bypasses absorption processes and it enters into the Circulation directly.

1. **Routes of drug administration**:

a) From the alimentary tract:
   (i) Buccal cavity: e.g. nitrates
   (ii) Stomach: e.g. aspirin, alcohol
   (iii) Intestine: e.g. most of non ionized and ionized drugs.
   (iv) Rectum: e.g. rectal suppositories, bisacodyl laxatives.

Advantages of oral route: This route is safe, convenient and economical.
Disadvantages of oral route: Onset of drug action is slow, irritant drugs cannot be Administered and it is not useful in vomiting and severe diarrhea, gastric acid and digestive Enzymes may destroy some drugs, and water soluble drugs are absorbed poorly.

1. Routes of drug administration:

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b) **From the parenteral route**:

   (i) **Intradermal**: This is given into the layers of the skin e.g. B.C.G. vaccine
   (ii) **Subcutaneous:** Non-irritant substances are given into subcutaneous tissue e.g. insulin
   (iii) **Intramuscular:** Soluble substances, mild irritants, suspensions and colloids can be injected by this route. These injections can be given to deltoid or gluteal muscle. This Route is one of the more common routes e.g. multivitamins, streptomycin, etc.

Advantages:

Rate of absorption is uniform, onset of action is faster than oral and It can be given in diarrhoea or vomiting.

Disadvantages:

Pain at local site of injection, the volume of injection should not Exceed 10 ml.

(iv) Intravenous: Drugs directly given into a vein, produce rapid action, no need of Absorption as they enter directly into blood, can be given as bolus e.g. furosemide, Morphine, dopamine or as continous infusion e.g. fluids during shock or Dehydration.

Advantages: It can be given in large volumes, production of desired blood Concentration can be obtained with a well designed dose.

Disadvantages: Drug effect cannot be halted if once the drug is injected, Expertise is needed to give injection.

(v)Intrathecal: Injected into subarachnoid space of spinal cord e.g. spinal anesthetics.

(vi) Intraperitoneal: Injections given into the abdominal cavity e.g. infant saline, glucose.

(vii) Intra-articular: Injected directly into a joint e.g. hydrocortisone.

C) Transcutaneous route:

I) Iontophoresis: Galvanic current is used for bringing about the penetration of drugs into the deeper tissue e.g. salicylates.

Ii) Inunctions: Absorbed when rubbed in to the skin e.g. nitroglycerin ointment in angina Pectoris.

Iii) Jet injection: With help of high velocity jet produced through a micro fine orifice; No Need of needle and therefore painless. E.g. mass inoculation programes.

Iv) Adhesive units: A transdermal therapeutic system produce prolonged effect e.g. scopolamine for motion sickness.

D) Topical/ local route:

The absorption through skin is a passive process. The absorption occurs more easily through the cell lining e.g. dusting powder, paste, lotion, drops, ointment, suppository for vagina and rectum.

E) Inhalation:

Drugs may be administered as dry powders, and nebulized particles when sprayed as fine Droplets get deposited over the mucous membrane producing local effects and may be absorbed for systemic effects e.g. salbutamol spray used in bronchial asthma and volatile General anesthetics.

2. **Bioavailability**:

It is the rate and amount of drug that is absorbed from a given dosage form and reaches the Systemic circulation following non-vascular administration. When the drug is given IV, the Bioavailability is 100%. It is important to know the manner in which a drug is absorbed. The Route of administration largely determines the latent period between administration and onset of Action.

Drugs given by mouth may be inactive for the following reasons:

a) Enzymatic degradation of polypeptides within the lumen of the gastrointestinal tract e.g. Insulin, ACTH.
b) Poor absorption through gastrointestinal tract e.g. aminoglycoside antibiotic.
c) Inactivation by liver e.g. testosterone during first passage through the liver before it reaches Systemic circulation.

3. Factors affecting drug absorption and bioavailability:

a) Physico-chemical properties of drug

b) Nature of the dosage form

c) Physiological factors

d) Pharmacogenetic factors

e) Disease states.

a) Physico-chemical properties of drug:

Physical state: Liquids are absorbed better than solids and crystalloids absorbed better Than colloids.

ii) Lipid or water solubility: Drugs in aqueous solution mix more readily than those in oily Solution. However at the cell surface, the lipid soluble drugs penetrate into the cell more Rapidly than the water soluble drugs.

iii) Ionization: Most of the drugs are organic compounds. Unlike inorganic compounds, the Organic drugs are not completely ionized in the fluid. Unionized component is Predominantly lipid soluble and is absorbed rapidly and an ionized is often water soluble Component which is absorbed poorly. Most of the drugs are weak acids or weak bases. It may be assumed for all practical purposes that the mucosal lining of the G.I.T is Impermeable to the ionized form of a weak organic acid or a weak organic base. These Drugs exist in two forms.

Acidic drugs:

Rapidly absorbed from the stomach e.g. salicylates and barbiturates.

Basic drugs:

Not absorbed until they reach to the alkaline environment i.e. small Intestine when administered orally e.g. pethidine and ephedrine.

Dosage forms:

Particle size: Small particle size is important for drug absorption.

Drugs given in a dispersed or emulsified state are absorbed better e.g. vitamin D and vitamin A.

Disintegration time and dissolution rate.

Disintegration time: The rate of break up of the tablet or capsule into the drug granules.

Dissolution rate: The rate at which the drug goes into solution.

Formulation: Usually substances like lactose, sucrose, starch and calcium phosphate

Are used as inert diluents in formulating powders or tablets. Fillers may not be totally

Inert but may affect the absorption as well as stability of the medicament. Thus a faulty

Formulation can render a useful drug totally useless therapeutically.

Physiological factors:

Gastrointestinal transit time: Rapid absorption occurs when the drug is given on empty stomach. However certain irritant drugs like salicylates and iron preparations are deliberately administred after food to minimize the gastrointestinal irritation. But some times the presence of food in the G.I tract aids the absorption of certain drugs e.g. griseofulvin, propranolol and riboflavin.

ii) Presence of other agents: Vitamin C enhances the absorption of iron from the G.I.T. Calcium present in milk and in antacids forms insoluble complexes with the tetracycline antibiotics and reduces their absorption.

Area of the absorbing surface and local circulation: Drugs can be absorbed better from the small intestine than from the stomach because of the larger surface area of the former. Increased vascular supply can increase the absorption.

Enterohepatic cycling: Some drugs move in between intestines and liver before they reach the site of action. This increases the bioavailability e.g. phenolphthalein.

Metabolism of drug/first pass effect: Rapid degradation of a drug by the liver during the first pass (propranolol) or by the gut wall (Isoprinosine) also affects the bioavailability. Thus a drug though absorbed well when given orally may not be effective because of its extensive first pass metabolism.

Pharmacogenetic factors:

Individual variations occur due to the genetically mediated reason in drug absorption and response.

Disease states:

Absorption and first pass metabolism may be affected in conditions like malabsorption, thyrotoxicosis, achlorhydria and liver cirrhosis.

Bioavailability curves

Single dose bioavailability test involves an analysis of plasma or serum concentration of the drug at various time intervals after its oral administration and plotting a serum concentration time crave.

C) Distribution of drugs

Definition: Penetration of a drug to the sites of action through the walls of blood vessels from the administered site after absorption is called drug distribution. Drugs distribute through various body fluid compartments such as

Plasma

Interstitial fluid compartment

Trans-cellular compartment.

Apparent Volume of distribution (VD): The volume into which the total amount of a drug in the body would have to be uniformly distributed to provide the concentration of the drug actually measured in the plasma. It is an apparent rather than real volume.

Factors determining the rate of distribution of drugs:

1. Protein binding of drug: A variable and other significant portion of absorbed drug may become reversibly bound to plasma proteins. The active concentration of the drug is that Part which is not bound, because it is only this fraction which is free to leave the plasma and Site of action.
   (a) Free drug leave plasma to site of action
   (b) Binding of drugs to plasma Proteins assists absorption
   (c) Protein binding acts as a temporary store of a drug and tendsTo prevent large fluctuations in concentration of unbound drug in the body fluids
   (d) Protein Binding reduces diffusion of drug into the cell and there by delays its metabolic degradation

E.g. high protein bound drug like phenylbutazone is long acting.

Low protein bound drug like thiopental sodium is short acting.

2. **Plasma concentration of drug (PC):** It represents the drug that is bound to the plasma Proteins (albumins and globulins) and the drug in free form. It is the free form of drug that is distributed to the tissues and fluids and takes part in producing pharmacological effects.

The concentration of free drug in plasma does not always remain in the same level e.g.

i) After I.V. administration plasma concentration falls sharply

ii) After oral administration plasma concentration rises and falls gradually.

iii) After sublingual administration plasma concentration rise sharply and falls gradually.

3. Clearance: Volume of plasma cleared off the drug by metabolism and excretion per unit time.

Protein binding reduces the amount of drug available for filtration at the glomeruli and hence

Delays the excretion, thus the protein binding reduces the clearance.

4. Physiological barriers to distribution: There are some specialized barriers in the body due

To which the drug will not be distributed uniformly in all the tissues.

These barriers are:

a) Blood brain barrier (BBB) through which thiopental sodium is easily crossed but not

Dopamine.

b) Placental barrier: which allows non-ionized drugs with high lipid/water partition

Coefficient by a process of simple diffusion to the foetus e.g. alcohol, morphine.

5. Affinity of drugs to certain organs: The concentration of a drug in certain tissues after a Single dose may persist even when its plasma concentration is reduced to low. Thus the Hepatic concentration of mepacrine is more than 200 times that of plasma level. Their Concentration may reach a very high level on chronic administration. Iodine is similarly concentrated in the thyroid tissue.

D. metabolism of drugs: Drugs are chemical substances, which interact with living organisms and produce some Pharmacological effects and then, they should be eliminated from the body unchanged or by Changing to some easily excretable molecules. The process by which the body brings about Changes in drug molecule is referred as drug metabolism or biotransformation.

Enzymes responsible for metabolism of drugs:

a) Microsomal enzymes: Present in the smooth endoplasmic reticulum of the liver, kidney And GIT e.g. glucuronyl transferase, dehydrogenase, hydroxylase and cytochrome P450.

b) Non-microsomal enzymes: Present in the cytoplasm, mitochondria of different organs. E.g. esterases, amidase, hydrolase.

Types of biotransformation: The chemical reactions involved in biotransformation are classified as phase-I and phase – II (conjugation) reactions. In phase-I reaction the drug is Converted to more polar metabolite. If this metabolite is sufficiently polar, then it will be excreted in urine. Some metabolites may not be excreted and further metabolised by phase –II reactions.

Phase-I: Oxidation, reduction and hydrolysis.

Phase-II: Glucuronidation, sulfate conjugation, acetylation, glycine conjugation and Methylation reactions.

PHASE – I REACTIONS

a) **Oxidation:** Microsomal oxidation involves the introduction of an oxygen and/or the removal of A hydrogen atom or hydroxylation, dealkylation or demethylation of drug molecule e.g. Conversion of salicylic acid into gentisic acid.

b) **Reduction:** The reduction reaction will take place by the enzyme reeducates which catalyze the reduction of ado (-N=N-) and nitro (-NO2) compounds e.g. prontosil converted to Sulfonamide.

c) **Hydrolysis**: Drug metabolism by hydrolysis is restricted to esters and amines (by esterase's and amides) are found in plasma and other tissues like liver. It means splitting of drug Molecule after adding water e.g. pethidine undergoes hydrolysis to form pethidinic acid. Other drugs which undergo hydrolysis are atropine and acetylcholine.

Phase – II reactions (conjugation reactions):

This is synthetic process by which a drug or its metabolite is combined with an endogenous Substance resulting in various conjugates such as glucoronide, ethereal sulfate, methylated Compound and amino acid conjugates.

Glucuronide conjugation: It is the most common and most important conjugation reaction of Drugs. Drugs which contain

a) Hydroxyl, amino or carboxyl group undergo this process e.g. phenobarbitone.
b) Sulfate conjugation: Sulfotransferase present in liver, intestinal mucosa and kid
c) Acetyl conjugation: The enzyme acetyl transferase, which is responsible for acetylation, is present in the kupffer cells of liver. Acetic acid is conjugated to drugs via its activation By CoA to form acetyl CoA. This acetyl group is then transferred to-NH2 group of drug e.g. dapsone, isoniazid.
d) Glycine conjugation: Glycine conjugation is characteristic for certain aromatic acids

E.g. salicylic acid, isonicotinic acid, p-amino salicylic acid. These drugs are also metabolized by other path ways.

e) Methylation: Adrenaline is methylated to metanephrine by catechol-o-methyl transferase.

Here the source of methyl group is s – adenosyl methionine.

E. Excretion of drugs

Excretion of drugs means the transportation of unaltered or altered form of drug out of theBody. The major processes of excretion include renal excretion, hepatobiliary excretion and pulmonary excretion. The minor routes of excretion are saliva, sweat, tears, breast milk, vaginal Fluid, nails and hair. The rate of excretion influences the duration of action of drug. The drug that is excreted slowly, the concentration of drug in the body is maintained and the effects of the drug will continue for longer period.

Different routes of drug excretion

a) **Renal excretion**: A major part of excretion of chemicals is metabolically unchanged or changed. The excretion of drug by the kidney involves.

i) Glomerular filtration

ii) Active tubular secretion

iii) Passive tubular reabsorption.

The function of glomerular filtration and active tubular secretion is to remove drug out of theBody, while tubular reabsorption tends to retain the drug.

i) **Glomerular filtration:** It is a process, which depends on
(1) The concentration of drug in the Plasma
(2) Molecular size, shape and charge of drug
(3) Glomerular filtration rate.

Only the Drug which is not bound with the plasma proteins can pass through glomerulus. All the drugs which have low molecular weight can pass through glomerulus e.g. digoxin, ethambutol, etc. In congestive cardiac failure, the glomerular filtration rate is reduced due to decrease in renal Blood flow.

ii) Active tubular secretion:

The cells of the proximal convoluted tubule actively transport drugs from the plasma into the lumen of the tubule e.g. acetazolamide, benzyl penicillin, dopamine, pethidine, thiazides, histamine.

iii) Tubular reabsorption:

The reabsorption of drug from the lumen of the distal convoluted tubules into plasma occurs either by simple diffusion or by active transport. When the urine is acidic, the degree of ionization of basic drug increase and their reabsorption decreases. Conversely, when the urine is more alkaline, the degree of ionization of acidic drug increases and the reabsorption decreases.

b) **Hepatobiliary excretion**: the conjugated drugs are excreted by hepatocytes in the bile. Molecular weight more than 300 Daltons and polar drugs are excreted in the bile. Excretion Of drugs through bile provides a back up pathway when renal function is impaired. After Excretion of drug through bile into intestine, certain amount of drug is reabsorbed into portal Vein leading to an enterohepatic cycling which can prolong the action of drug e.g. Chloramphenicol, oral estrogen are secreted into bile and largely reabsorbed and have long Duration of action. Tetracycline's which are excreted by biliary tract can be used for treatment of biliary tract infection.
c) **Gastrointestinal excretion:** When a drug is administered orally, a part of the drug is not Absorbed and excreted in the faeces. The drugs which do not undergo enterohepatic cycle After excretion into the bile are subsequently passed with stool e.g. aluminium hydroxide Changes the stool into white colour, ferrous sulfate changes the stool into black and Rifampicin into orange red.
d) **Pulmonary excretion:** Drugs that are readily vaporized, such as many inhalation Anesthetics and alcohols are excreted through lungs. The rate of drug excretion through Lung depends on the volume of air exchange, depth of respiration, rate of pulmonary blood Flow and the drug concentration gradient.
e) **Sweat**: A number of drugs are excreted into the sweat either by simple diffusion or active Secretion e.g. rifampicin, metalloids like arsenic and other heavy metals.
f) **Mammary excretion**:
Many drugs mostly weak basic drugs are accumulated into the milk. Therefore lactating mothers should be cautious about the intake of these drugs because they may enter into baby through breast milk and produce harmful effects in the baby e.g. Ampicillin, aspirin, chlordiazepoxide, coffee, diazepam, furosemide, morphine, streptomycin Etc.

Clearance of a drug: It is the volume of plasma cleared of the drug by metabolism (hepatic) and excretion (renal) and other organs.

Total clearance will be calculated by Ct = Ch + Cr + C others

Ct = total clearance

Ch = hepatic clearance

R = Renal clearance

IV. Theoretical Pharmacokinetics

Information about the time course of drug absorption, distribution and elimination (pharmacokinetics) can be expressed in mathematical terms and has contributed to our Understanding and planning of drug regimens. Pharmacokinetic principles aid in the selection and adjustment of drug-dose schedules.

Half life:

Half life (t1/2) of a drug is the time taken for the concentration of drug in the blood or plasma to Decline to half of original value or the amount of drug in the body to be reduced by 50%. It has two phases' i.e. half-life of distribution and half-life of elimination. A half-life value can be readily determined for most drugs by administering a dose of the drug to A subject, taking blood samples at various time intervals and then assaying the samples., For Example if a blood level of drug A is 8.6 mg/ml at 10 minutes and 4.3 mg/ml at 60 minutes, so

The half – life of that drug is 50 minutes.

In most of the cases the rate of disappearance of a drug from the body is reflected in the rate of Lowering of its plasma concentration following a single intravenous dose, the plasma Concentration of the drug is focused to fall exponentially. With drugs whose elimination is Exponential, the biological half – life is independent of the dose, the route of administration and the plasma concentration. It depends on VD as well as on the metabolism and renal excretion of the drug.

Order of kinetics

Drugs are used for the treatment of diseases but the modes of administration of drugs are different. For example atenolol is administered once daily where as paracetamol needs 3-4times administration daily. Morphine is more effective in intramuscular route, and insulin is in subcutaneous route. The mode of administration is designed on the basis of absorption, distribution, metabolism and excretion (ADME) of drugs. Drugs usually follow two processes for their pharmacokinetic behavior in the body. These are first order and zero order process.

First order:

This is the most common process for many drugs. The rate at which absorption, distribution, metabolism and excretion occur are proportional to the concentration of drugs i.e. constant fraction of this drug in the body disappears in each equal interval of time.

Zero order kinetic:

It is independent of the amount of drug present at the particular sites of drug absorption or elimination. Few drugs follow this process e.g. ethanol, phenytoin. Here constant amount of the drug is eliminated in each equal interval of time. On repeated administration of drug after certain stage it goes on accumulating in the body and leads to toxic reactions.

Steady state plasma concentration:

When a drug dose is given repeatedly over a given period, a steady state is eventually reached, at which point the amount of drug absorbed is in equilibrium with that eliminated from the body. Steady

state is achieved after 4 to 5 half –lives for most of the drugs which follow first order kinetics. For example a drug with half life of 6 hours will be expected to be at steady state after more than 24 hours of administration. The pattern of drug accumulation during repeated administration of drug at intervals equal to its elimination half-life. For some drugs, the effects are difficult to measure, toxicity and lack of efficacy are both Potential dangers, and/or the therapeutic window is narrow. In these circumstances doses must be adjusted carefully to a desired steady- state concentration by giving loading and Maintenance doses.

Loading dose: The loading dose is one or a series of doses that may be given at the onset of Therapy with the aim of achieving the target concentration rapidly.

Maintenance dose: To maintain the chosen steady-state or target concentration, the rate of drug Administration is adjusted such that the rate of input equals to rate of loss.

V. Drug safety and effectiveness

A. Factors modifying the dosage and action of drugs :

Individuals differ both in the degree and the character of the response that a drug may elicit and therefore the optimum dose of a drug which produces the desired therapeutic effect varies from Person to person. The important factors which influence the effect of a drug are:

1. **Drug intolerance:** It is a quantitative deviation from the anticipated response to a given dose of a drug. Thus drug intolerance is inability of the individual to tolerate a drug. It is also called as hyper susceptibility.
2. **Sex difference**: Special care should be exercised when drugs are administrated during Menstruation, pregnancy and lactation.
    a) **Menstruation**: Drugs producing pelvic congestion should be avoided during menstruation e.g. drastic purgatives.
    b) **Pregnancy**: During pregnancy, the use of all drugs except those essential to maintain Pregnancy should be used with caution. Drugs which may stimulate the uterine smooth Muscle, are contraindicated during pregnancy. Further, many drugs administered to Mother are capable of crossing the placenta and affecting the foetus. Most of drugs can produce teratogenicity when they are used in pregnancy. Teratogenicity means Congenital malformation
        i) Drugs known to produce teratogenicity e.g thalidomide, Cyclophosphamide, methotrexate, tetracycline, phenytoin, carbamazepine and Progestogens.
        ii) Ii) Drugs may be teratogenicity e.g Warfarin, lithium, quinine, primaquine, Trimethoprim, rifampicin, anesthetic agents.
    c) **Breast feeding:** Nearly all agents received by mother are likely to be found in her milk and could theoretically harm the infant. Most of the lipid soluble drugs get into breast Milk. Therefore the drugs, which are excreted in the milk and harm the infant health should be, avoided by breast-feeding mothers e.g. sulphonamides, tetracycline's, Nalidixic acid, isoniazid, diazepam, lithium, Indomethacin, aspirin, etc.

3. **Body Weight:** The average dose is mentioned either in terms of mg per kg body weight or as the total single dose for an adult weighing between 50-100kg. However, dose expressed in this fashion may not apply in cases of excessively obese individuals or those suffering from Edema, or dehydration nutritional factors can sometimes alter drug metabolizing capacity and this should be kept in mind in malnourished patients.
4. **Age**: The pharmacokinetics of many drugs changes with age. Thus gastric emptying is Prolonged and the gastric pH fluctuates in neonates and infant, further the liver capacity to Metabolize drugs is low, renal function is less developed and the proportion of body water is Higher in the newborn and the neonates. Hence children may not react to all drugs in the same fashion as young adults. With a few exceptions, drugs are more active and more toxic in the new born than the adults. The pediatric doses are expressed in terms of body weight (mg/kg per dose or day) or in terms Of body surface area (mg/m2Per day). The body surface area can be calculated from the height and weight of the child. Like children, old people also present problems in dosage adjustment and this may vary widely with different people. The metabolism of drugs may diminish in the elderly and the renal function Declines with age. Elderly are sensitive to the drugs like hypnotics, tranquilizers, Phenylbutazone, diazepam, pethidine, etc.

5. Disease state: Some antimicrobial agents penetrate the cerebrospinal fluid well across the meninges while other antimicrobials penetrate well only when the meninges are inflamed (meningitis) e.g. sulphonamides, metronidazole, chloramphenicol, isoniazid and rifampicin penetrate well through the normal meninges and other antimicrobial agents like benzyl penicillin, ampicillin, tetracycline, streptomycin, gentamicin and cephalosporin penetrate only when the meninges are inflamed. Acute or chronic liver diseases markedly modify the rate and extent of biotransformation of drugs. The t1/2 of chlordiazepoxide and diazepam in patients with liver cirrhosis is greatly increased with corresponding prolongation of their effects. Cardiac disease by limiting blood flow to the liver may impair disposition of those drugs whose biotransformation is flow limited e.g. imipramine, isoniazid, lignocaine, morphine and propranolol. Similarly renal and pulmonary diseases may modify the biotransformation of drugs like insulin or Isoprinosine. Excretion of drug is impaired in chronic renal disease.

6. **Pharmacogenetic**: The science Pharmacogenetic is concerned with the genetically mediated variations in drug responses. Some examples of genetically mediated variations are:

Acetylation and hydroxylation of drugs: The rate of acetylation of INH, dapsone, hydralazine procainamide and some sulfonamides is controlled by an autosomal recessive gene and the dosage of these drugs depends up on the acetylator status of individuals.

7) Drug interactions:

It is usual for patients to receive a number of drugs at the same time. It is a phenomenon which occurs when the effects of one drug are modified by the prior or concurrent administration of another drug(s). A drug interaction may result in beneficial or harmful effects and may be classified into:

a) Pharmaceutical drug interactions:

Serious loss of potency can occur from incompatibility between an infusion fluid and a drug that is added to it.

For example diazepam if added to infusion fluid there will be a precipitate formation → loss of therapeutic effect.

b) Pharmacokinetic drug interactions:

1) Interaction during absorption: Drugs may interact in the gastrointestinal tract resulting in either decreased or increased absorption.

E.g. Tetracycline + Calcium → Decreased absorption of tetracycline.

2) Interaction during distribution: A drug which is extensively bound to plasma protein can be displaced from its binding sites by another drug or displacement from other tissue binding sites.

e.g. (I) Sulfonamide can be displaced by salicylates from plasma proteins and it leads to sulfonamide toxicity.

(ii) Quinidine displaces digoxin from binding sites in tissues and plasma and leads to digoxin toxicity.

3) Interactions during biotransformation: This can be explained by two mechanisms:

(i) Enzyme induction.
(ii) Enzyme inhibition.

(i) **Enzyme induction:** By this the biotransformation of drugs is accelerated and is a cause of Therapeutic failure. If the drug A is metabolized by the microsomal enzymes, then concurrent Administration with a microsomal inducer (drug B) will result in enhanced metabolism of drug
A.

E.g. Warfarin (anticoagulant) + Barbiturate (enzyme inducer) → decreased anticoagulation.

Enzyme inducers: Rifampicine, phenytoin, sulfonamides, etc.

(iii) **Enzyme inhibition:** By this the biotransformation of drugs is delayed and is a cause of increased intensity, duration of action and some times toxicity.

E.g. Warfarin + Metronidazole (enzyme inhibitor) → Haemorrhage.

Enzyme inhibitors: Disulfiram, isoniazid, allopurinol, cimetidine, etc.

f) Interactions during excretion: Some drugs interacts with others at the site of excretion i.e. in kidneys.

E.g. Penicillin (antibiotic) + Probenecid (antigout drug) → Increases the duration of action of

Penicillin (Both drugs excreted through tubular secretion).

B. Pharmacodynamic interactions:

(i) Drug Synergism: When the therapeutic effect of two drugs are greater than the effect of Individual drugs, it is said to be drug synergism.It is of two types.

(a) Additive effect: When the total pharmacological action of two or more drugs administered

Together is equivalent to the summation of their individual pharmacological actions is called

Additive effect.

I.e. A + B = AB

E.g. Combination of ephedrine and aminophyllin in the treatment of bronchial asthma.

(b) Potentiation effect: When the net effect of two drugs used together is greater than the sum of

d) Check liver and kidney function before and during drug administration, as even an otherwise non-cumulative drug would produce cumulation in the presence of hepatic and renal damage.

9) Drug tolerance:

When an unusually large dose of a drug is required to elicit an effect ordinarily produced by the normal therapeutic dose of the drug, the phenomenon is termed as drug tolerance.

Tachyphylaxis: Rapid development of tolerance on repeated administration is called tachyphylaxis e.g. Ephedrine, amphetamine and nitroglycerine which produce tachyphylaxis on repeated administration.

10) Emotional factors.

E.g. Placebo response.

Placebo: It is a Latin word meaning" I shall please" and it is a tablet looking exactly like the active treatment but containing no active component. It refers originally to substances merely to please the patient when no specific treatment was available.

B. Adverse drug reactions:

The drugs that produce useful therapeutic effect may also produce unwanted or toxic effects. It been estimated that about 0.5% of patients who die in hospitals do so as a result of their treatment rather than the condition for which they were treated. Serious systemic drug toxicity may result from overdoses. If is always an exaggeration of its pharmacological actions and some times it is predictable. E.g. Hypotension following antihypertensive drugs. Hypoglycaemia following insulin. An adverse drug reaction is defined as any response to a drug that is noxious and unintended and that occurs at doses used in man for prophylaxis, diagnosis or therapy (WHO).

The adverse effects are

1) Side effects

2) Untoward effects

3) Allergic reactions

4) Idiosyncratic reactions and

5) Teratogenicity effects.

C. **1) Side effects:** Side effects are infact pharmacological effects produced with therapeutic dose
D. Of the drug.
E. e.g: Dryness of mouth with atropine which is troublesome in peptic ulcer patients and useful
F. When used as a preanaesthetic medication.

2) Untoward effects: Untoward effects develop with therapeutic dose of a drug. They are Undesirable and if very severe, may necessitate the cessation of treatment.

e.g: Diarrhoea with ampicillin and potassium loss with diuretics.

3) Allergic reactions: Most of the drugs and sera used in therapeutics are capable of causing Allergic or hypersensitive reactions. These reactions may be mild or very severe like. When an individual has been sensitized to an antigen (allergen) further contact with that antigen can some times lead to tissue damaging reactions. These allergic reactions

Are 4 types.

- Type-I reactions or anaphylactic reactions (Immediate hypersensitive reaction).
- Type-II reactions or cytotoxic reactions.
- Type-III reactions or immune complex mediated reactions.
- Type-IV reactions or cell mediated reactions (Delayed hypersensitive reactions).

4) Idiosyncratic reactions: The term idiosyncrasy means one's peculiar response to drugs. With the increasing knowledge of Pharmacogenetic, many idiosyncratic reactions have been found to be genetically determined.

e.g: Drugs like primaquine, sulfonamides and dapsone may cause hemolysis in patients with glucose - 6 phosphate dehydrogenase deficiency.

5) Teratogenic effect: Some drugs given in the first three months of pregnancy may cause congenital abnormalities and are said to be teratogenic. The best known example is Thalidomide which results in early easily recognizable abnormalities such as absent or grossly abnormal limbs.

Other drugs with teratogenic potential are androgens, steroids, anti consultants, anti neoplastic Drugs, cortisone, lithium, pencillamine, tricyclic antidepressants and warfarin.

V) Development and evaluation of new drugs:

The ultimate aim of pharmacological studies in animals is to find out a therapeutic agent suitable for clinical evaluation in man. No doubt, animal studies provide analogies and serve as useful Models. The administration of biologically active agent to human beings is associated with an Element of risk, which cannot be predicted by even the most careful and exhaustive animal Experiments.

Scientists all over the world are in a continuous effort to develop new drugs although drug Development is an extremely technical and enormously expensive operation. Among the contributors to new drug development, pharmacologists are more concerned in evaluating "new

Chemical entities" (NCE). Synthesis and evaluation of thousands of NCEs are usually necessary for new drugs to be introduced in the market. Research and development of new drugs have been done under strict government regulations which have greatly increased over the past couple of decades.

Drug development comprises of two steps.

a) Preclinical development and

b) Clinical development

A) Preclinical development: Synthesis of new chemical entities is done as per research policy decision which is based on:

(I) Random synthesis

(ii) Structure activity relationship (SAR)

(iii) Biochemical and pharmacological insight and

(iv) Chance finding.

The aim of the preclinical development phase for a potential new medicine is to explore the drug's efficacy and safety before it is administrated to patients. In this preclinical phase, varying drug doses are tested on animals and/or in vitro systems.

If active compounds are found, then studies on animals are done which include pharmacodynamics, pharmacokinetics, toxicology and special toxicological studies (mutagenicity and carcinogenicity) have to be done. In this study single dose is used for acute toxicity and repeated doses for sub chronic and chronic toxicity studies. Most of the preclinical tests have to be conducted in accordance with the standards prescribed.

B) Clinical development: About one in 1000 NCEs reach this stage. The steps to be studied in

This stage include:

a) Pharmaceutical study

b) Pharmacological study

c) Clinical trial.

a) Pharmaceutical study covers stability of formulation and compatibility of the NCEs with other tablet or infusion ingredients.

b) Pharmacological study includes further chronic toxicological study in animal, initially animal Metabolic and pharmacokinetic study. When studies in animals predict that a NCE may be Useful medicine i.e. effective and safe in relation to its benefits, then the time has come to put it to the test in man i.e. clinical trial.

c) Studies on human or Clinical Trial: Clinical trial is a means by which the efficacy of drug is tested on human being. It may also give some idea about the risk involved. It is divided into 4 phases. With each phase, the safety and Efficacy of the compound are tested progressively.

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Annexure - III

Assessment Form

Sri Lakshmi Narayana Institute of Medical Sciences, Puducherry.

Course code: VAC04/AHS/2019-18/11

Multiple Choice Question 12x2=24

1. Type I ADR reactions is_____

A) Caused when T-cells bind to a specific antigen
b) Caused by tissue injury
c) IgE mediated
d) Caused by cytotoxic antibodies

2. Average time period for phase II clinical trials study is _____

a) Up to 4 year
b) Up to few month
c) Up to Two year
d) Up to several year

3. _____ drug can cause lactic acidosis.

a) Metformin
b) Pioglitazone
c) Repaginate
d) Glibenclamide

4. The incidence ADR is highest in _____.

a) Children
b) Elderly
c) Women
d) Men

5. _____ antihypertensive therapy should be avoided in type-1 diabetes mellitus

a) ACE inhibitors
b) High dose diuretics
c) Centrally acting
d) Calcium channel blockers

6. _____ is an example of Category X drugs

a) Diclofenac
b) Ranitidine
c) Lorazepam
d) Paracetamol

7. _____ is indicated in agitation and restlessness in the elderly, despite the high incidence Of extrapyramidal side-effects.

a) Prochlorperazine
b) Clozapine
c) Haloperidol
d) Flupentixol

8. _____ is contraindicated during pregnancy due to its Teratogenicity.

a) Folic acid
b) Calcium
c) Retinol
d) Iron

9. _____ commonly reported ADR of diuretic class of drugs.

a) Hypokalaemia
b) Alopecia
c) Skin disorder
d) Rhinitis

10. Which of the following responsibility of the clinical pharmacist is in direct patient care area?

a) Supervision of drug administration techniques.
b) Providing drug information to physicians and nurses.
c) Identify drugs brought into the hospital by patients.
d) Reviewing of each patient's drug administration forms periodically to ensure all doses have been administered.

11. Which of the following responsibility of community pharmacist is in dispensing area?

a) Reviews all doses missed, reschedule the doses as necessary & signs all drugs not given notices.
b) Supervision of drug administration.
c) Ensures that establishes policies & procedures are followed.
d) Reviewing of each patient's drug administration forms periodically to ensure all doses have been administered.

12. The most specific & sensitive method for assessment of compliance can be used to Detect potent therapeutic agent in body fluids is

a) Drug analysis.
b) Interrogation.
c) Urine marker.
d) Residual Tablet counting.

Qamqp-UAH1801142

SRI LAKSHMI NARAYANA INSTITUE OF HIGHER EDUCATON AND RESEARCH

Annexure - III

Assessment Form

Sri Lakshmi Narayana Institute of Medical Sciences, Puducherry.

Course code: VAC04/AHS/2019-18/11

Multiple Choice Question 12x2=24

1. Type I ADR reactions is_____

A) Caused when T-cells bind to a specific antigen
b) Caused by tissue injury
c) IgE mediated
d) Caused by cytotoxic antibodies

2. Average time period for phase II clinical trials study is _____

a) Up to 4 year
b) Up to few month
c) Up to Two year
d) Up to several year

3. _____ drug can cause lactic acidosis.

a) Metformin
b) Pioglitazone
c) Repaginate
d) Glibenclamide

4. The incidence ADR is highest in _____.

a) Children
b) Elderly
c) Women
d) Men

SRI LAKSHMI NARAYANA INSTITUE OF HIGHER EDUCATON AND RESEARCH

5. _____ antihypertensive therapy should be avoided in type-1 diabetes mellitus

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SRI LAKSHMI NARAYANA INSTITUE OF HIGHER EDUCATON AND RESEARCH

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SRI LAKSHMI NARAYANA INSTITUE OF HIGHER EDUCATON AND RESEARCH

Annexure - III

Assessment Form

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Course code: VAC04/AHS/2019-18/11

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Annexure- V

Student Feedback Form

Course Name: "CLINICAL PHARMACOLOGY"

Subject Code: VAC04/AHS/2019-18/11

Name of Student: _____ Roll No.: _____

We are constantly looking to improve our classes and deliver the best training to you. Your evaluations, comments and suggestions will help us to improve our performance

Feedback Form

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
1. The course met my expectations.	○	○	○	○	○
2.I will be able to apply the knowledge learned.	○	○	○	○	○
3.The course objectives for each topic were identified and followed.	○	○	○	○	○
4.The content was organised and easy to follow.	○	○	○	○	○
5.The quality of instruction was good.	○	○	○	○	○
6.Class participation and interaction were encouraged.	○	○	○	○	○
7.Adequate time was provided for questions and discussion.	○	○	○	○	○

8.How do you rate the course overall?

- ○ Excellent
- ○ Good
- ○ Average
- ○ Poor
- ○ Very poor

9. The aspects of the course could be improved?

10. Other comments?

Signature of the student:
Date:

Annexure- V

Student Feedback Form

Course Name: "CLINICAL PHARMACOLOGY"

Subject Code: VAC04/AHS/2019-18/11

Name of Student: AJITH KUMAR Roll No.: VAH18011130.

We are constantly looking to improve our classes and deliver the best training to you. Your evaluations, comments and suggestions will help us to improve our performance

Feedback Form

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
1. The course met my expectations.	●	○	○	○	○
2.I will be able to apply the knowledge learned.	○	●	○	○	○
3.The course objectives for each topic were identified and followed.	●	○	○	○	○
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5.The quality of instruction was good.	●	○	○	○	○
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7.Adequate time was provided for questions and discussion.	●	○	○	○	○

8.How do you rate the course overall?

- ● Excellent
- ○ Good
- ○ Average
- ○ Poor
- ○ Very poor

9. The aspects of the course could be improved? Good enough its more intellectual

10. Other comments? overall teaching level Good.

Signature of the student: V. Ajithkumar

Date: 13/12/2019

Annexure- V

Student Feedback Form

Course Name: "CLINICAL PHARMACOLOGY"

Subject Code: VAC04/AHS/2019-18/11

Name of Student: Alaguri Sandeep Roll No.: UAH1801189.

We are constantly looking to improve our classes and deliver the best training to you. Your evaluations, comments and suggestions will help us to improve our performance

Feedback Form

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
1. The course met my expectations.	●	○	○	○	○
2.I will be able to apply the knowledge learned.	○	●	○	○	○
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5.The quality of instruction was good.	●	○	○	○	○
6.Class participation and interaction were encouraged.	●	○	○	○	○
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- ○ Average
- ○ Poor
- ○ Very poor

9. The aspects of the course could be improved? -

10. Other comments? over all teaching was Good.

Signature of the student:
Date: 13/12/2019.

Annexure- V

Student Feedback Form

Course Name: "CLINICAL PHARMACOLOGY"

Subject Code: VAC04/AHS/2019-18/11

Name of Student: _____ Roll No.: _____

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Feedback Form

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10. Other comments?

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Date:

Annexure- V

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Signature of the student:
Date: 13/12/2019.

Date: 13.12.2019

From

Dr.G. Somasundaram
Principal of Allied Health Science,
Sri Lakshmi Narayana Institute of Medical Sciences
Bharath Institute of Higher Education and Research,
Chennai.

Through Proper Channel

To

The Dean,
Sri Lakshmi Narayana Institute of Medical Sciences
Bharath Institute of Higher Education and Research,
Chennai.

Sub: Completion of value-added course: CLINICAL PHARMACOLOGY

Dear Sir,

With reference to the subject mentioned above, the department has conducted the value-added course titled: **CLINICAL PHARMACOLOGY** November to December 2019 for 30 AHS Students. We solicit your kind action to send certificates for the participants that is attached with this letter. Also, I am attaching the photographs captured during the conduct of the course.

Kind Regards,

Dr. G. Somasundaram

Encl: Certificates

Photographs

Sri Lakshmi Narayana Institute of Medical Sciences

Date: 09.12.2020

From

Dr. G. Somasundaram
Principal of Allied Health Sciences,
Sri Lakshmi Narayana Institute of Medical Sciences
Bharath Institute of Higher Education and Research,
Chennai.

To

The Dean,
Sri Lakshmi Narayana Institute of Medical College
Bharath Institute of Higher Education and Research,
Chennai.

Sub: Permission to conduct value-added course: CLINICAL MICROBIOLOGY

Dear Sir,

With reference to the subject mentioned above, the department proposes to conduct a value-added course titled **CLINICAL MICROBIOLOGY** from January to February 2020. We solicit your kind permission for the same.

Kind Regards

Dr.G. Somasundaram

FOR THE USE OF DEANS OFFICE

Names of Committee members for evaluating the course:

The Dean: **Dr. Balagurunathan. K**

The HOD: **Dr. Somasundram. G**

The Expert: **Dr. Arvind.**

The committee has discussed about the course and is approved.

Dean	Subject Expert	HOD
(Sign & Seal)	(Sign & Seal)	(Sign & Seal)

DEAN
Prof.K.BALAGURUNATHAN,M.S
(General surgeon)
SRI LAKSHMI NARAYANA
INSTITUTE OF MEDICAL SCIENCES
OSUDU PONDICHERRY

PRINCIPAL
Allied Health Sciences
Sri Lakshmi Narayana Institute of Allied Health Sciences
Osudu, Agaram Post, Puducherry - 605 502.

OFFICE OF THE DEAN

Sri Lakshmi Narayana Institute of Medical Sciences

OSUDU, AGARAM VILLAGE, VILLIANUR COMMUNE, KUDAPAKKAM POST,
PUDUCHERRY - 605 502.
[Recognised by Medical Council of India, Ministry of Health letter No. U/12012/249/2005-ME (P -II) dt. 11/07/2011]
[Affliated to Bharath University, Chennai - TN]

Circular

23.12.2020

Sub: Organizing Value-added Course: CLINICAL MICROBIOLOGY .reg

With reference to the above-mentioned subject, it is to bring to your notice that Sri Lakshmi Narayana Institute of Medical Sciences, **Bharath Institute of Higher Education and Research** is organizing "**CLINICAL MICROBIOLOGY"**. The course content and registration form is enclosed below."

The application must reach the institution along with all the necessary documents as mentioned. The hard copy of the application should be sent to the institution by registered/ speed post only so as to reach on or before January to February 2020. Applications received after the mentioned date shall not be entertained under any circumstances.

Dean

DEAN
Prof.K.BALAGURUNATHAN,M.S
(General surgeon)
SRI LAKSHMI NARAYANA
INSTITUTE OF MEDICAL SCIENCES
OSUDU PONDICHERRY

Encl: Copy of Course content

VALUE ADDED COURSE

1. Name of the programme & Code

"CLINICAL MICROBIOLOGY". & VAC05/AHS/2020-06/01

2. Duration & Period

30 hrs. & January to February 2020

3. Information Brochure and Course Content of Value-Added Courses

Enclosed as Annexure- I

4. List of students enrolled

Enclosed as Annexure- II

5. Assessment procedures:

Assessment - *Enclosed as Annexure- III*

6. Certificate model

Enclosed as Annexure- IV

7. No. of times offered during the same year:

1-time January to February 2020

8. Year of discontinuation: 2021

9. Summary report of each program year-wise

Value Added Course- January to February 2020					
Sl. No	**Course Code**	**Course Name**	**Resource Persons**	**Target Students**	**Strength & Year**
1	VAC05/AHS/2020-06/01	"CLINICAL MICROBIOLOGY"	**Dr. Arvind**	AHS	30 students June to August 2020

10. Course Feed Back

Enclosed as Annexure- V

RESOURCE PERSON

COORDINATOR
Dr.G.Somasundram

PRINCIPAL
Allied Health Sciences
Sri Lakshmi Narayana Institute of Allied Health Sciences
Osudu, Agaram Post, Puducherry - 605 502.

Course Proposal

Course Title: "CLINICAL MICROBIOLOGY"

Course Objective:

1. To enhance the performance skill in Clinical Microbiology.
2. To assess the objectives and protocols in Clinical Microbiology.
3. To assess the reaction of target allied Health students towards the Clinical Microbiology getting their feedback.

Course Outcome: Improvement in the "CLINICAL MICROBIOLOGY"

Course Audience: Students of AHS Batch 20
Course Coordinator: Dr. G. Somasundaram
Course Faculties with Qualification and Designation:
1.Course Curriculum/Topics with schedule (Min of 30 hours)

SlNo	Date	Topic	Time	Hours
1.	06.01.2020	Introduction to Clinical microbiology	4-5p.m	1
2.	07.01.2020	Taxonomic classification of organisms	2-3p.m	1
3.	08.01.2020	binomial nomenclature	4-5p.m	1
4.	09.01.2020	Bacterial species	4-5p.m	1
5.	10.01.2020	eukaryotic cell and prokaryotic cell	4-5p.m	1
6.	11.01.2020	Bacterial Cell and Bacterial structure	4-5p.m	1
7.	13.01.2020	Bacterial structure and Cell envelope proper	4-5P.M	1
8.	17.01.2020	Components of cell wall of Gram-negative bacteria	4-5p.m	1
9.	18.01.2020	Functions of cell wall	4-5p.m	1
10.	20.01.2020	Cell membrane and Function of cell membrane	4-5p.m	1
11.	21.01.2020	Polyamines and Function of polyamines	4-5p.m	2
12.	22.01.2020	Cytoplasmic granules and Nuclear apparatus	4-5p.m	1
13.	23.01.2020	Flagellum and Flagellar arrangements	2-3p.m	1
14.	24.01.2020	Spores and Arrangements of spores	4-5p.m	1
15.	25.01.2020	Morphology of bacteria	4-5p.m	1

16.	27.01.2020	Staining of bacteria	3-5p.m	2
17.	28.01.2020	Why are stains not taken up by every microorganism? and Why are stains not taken up by every microorganism?	3-5p.m	2
18.	30.01.2020	General methods of staining	4-5p.m	1
19.	31.01.2020	Differentiation (decolorization)	4-5p.m	1
20.	01.02.2020	Types of microbiological stains and staining methods	3-5p.m	2
21.	03.02.2020	Ziehl-Neelson staining method and Procedure for Ziehl-Neelson staining method	4-5p.m	1
22.	04.02.2020	Cultivation of bacteria in culture media	4-5p.m	1
23.	05.02.2020	Assessment procedure and giving feedback in weaker areas	1-5p.m	4
		Total		**30hrs**

REFERENCE BOOKS:

1. *Thomson, R. B.; Wilson, M. L.; Weinstein, M. P. (2010). "The Clinical Microbiology Laboratory Director in the United States Hospital Setting". Journal of Clinical Microbiology. **48** (10): 3465–3469. doi:10.1128/JCM.01575-10. PMC 2953135. PMID 20739497.*
2. *Frank N. Egerton (2006). "A History of the Ecological Sciences, Part 19: Leeuwenhoek's Microscopic Natural History". Bulletin of the Ecological Society of America. **87**: 47–58. doi:10.1890/0012-9623(2006)87[47: AHOTES]2.0.CO;2.*
3. *Madigan M; Martinko J, eds. (2006). Brock Biology of Microorganisms (13th ed.). Pearson Education. p. 1096. ISBN 978-0-321-73551-5.*
4. *Brock TD (1999). Robert Koch: a life in medicine and bacteriology. Washington DC: American Society of Microbiology Press. ISBN 978-1-55581-143-3.*
5. Jump up to :*[a] [b] Willey, Joanne; Sandman, Kathleen; Wood, Dorothy (2020). Prescott's Microbiology. 2 Penn Plaza, New York, NY 10121: McGraw-Hill Education. p. 188. ISBN 978-1-260-21188-7.*

CLINICAL MICROBIOLOGY

INTRODUCTION TO MICROBIOLOGY

Microbiology is a subject which deals with living organisms that are Individually too small to be seen with the naked eye. It considers the microscopic forms of life and deals about their Reproduction, physiology, and participation in the process of nature, Helpful and harmful relationship with other living things, and Significance in science and industry. Subdivision of microbiology Bacteriology deals about bacteria. Mycology deals about fungi. Virology deals about viruses.

THE MICROBIAL WORLD

TAXONOMIC CLASSIFICATION OF ORGANISMS

TAXONOMY is the science of organismal classification. Classification is the assignment of organisms (species) into unorganized scheme of naming. ideally these schemes are based on evolutionary relationships (i.e the more similar the name, the closer the evolutionary relationships). Thus, classification is concerned with: -

The establishment of criteria for identifying organisms & assignment to groups (what belongs where)

The arrangement of organisms into groups of organisms of organism (e.g. At what level of diversity should a single species be split in to two or more species?).

Consideration of how evolution resulted in the formation these groups.

TAXON: -

A group or category of related organisms.

Two key characteristics of taxa are:

-Members of lower level taxa (e.g. Species) are more similar to each other than are members of higher-level taxa (e.g. Kingdom or domain).

-Member of specific taxa are more similar to each other than any are to members of different specific taxa found at the same hierarchical level (e.g. Humans are more similar to apes, i.e., comparison between species, than either is similar to, for example, Escherichia coli). Thus, once you know that two individuals are member of the same taxon, you can inter certain similarities between the two organisms. NOTE that taxa are dynamic, changing as our knowledge of organism and evolutionary relationships change

BINOMIAL NOMENCLATURE

Organisms are named using binomial nomenclature (viruses are exceptions)

Binomial nomenclature employs the names of the two-level taxa, genus and species, to name a specie.

Binomial nomenclature includes:

Genus comes before species (e.g., Escherichia coli)

Genus name is always capitalized (e.g., Escherichia)

Species name is never capitalized (e.g., coli)

Both names are always either italicized or underlined

(e.g. Escherichia coli)

The genus name may be used alone, but not the species name (i.e saying or writing "Escherichia "alone is legitimate while saying or writing "coli" is not) Strain

A strain in some ways is equivalent to a breed or

subspecies among plants or animal. Strain is the level

below the species

Two members of the same strain are more similar to each other than either is to an individual that is a member of a different strain, even if all three organisms are members of the same species

Bacterial species

- A bacterial species is defined by the similarities found among its members. Properties such as biochemical reactions, chemical composition, cellular structures, genetic characteristics, and immunological features are used in defining a bacterial species. Identifying a species and determining its limits presents the most challenging aspects of biological classification for any type of organism. A formal means of species is by employing a dichotomous key to guide the selection of test used to efficiently determine those bacterial properties most relevant to bacterial identification the five-kingdom system the five-kingdom system was first proposed in 1969 and is showing its age

The five kingdoms include:

- Plantae (the plants)
- Fungi (the fungi)
- Animalia (the animals)
- Protista (the unicellular eukaryotes)
- Monera (the prokaryotes)
- Kingdom of Monera

Three categories:

- Eubacteria Are our common, everyday bacteria, some of which are disease – causing; also, the taxon from which mitochondria originated.
- Cyanobacteria

Are photosynthetic eubacteria, the taxon from which chloroplast

Archaebacterial

Are distinctive in their adaptation to extreme environments (e.g., very hot, salty, or acidic) though not all archaebacterial live in extreme environments. These distinctions are more phenotypic than they are evolutionary

(i.e., a cyanobacteria are eubacteria, and neither is an

archaebacterial).

Kingdom Protista

Protista like Monera consist mostly of unicellular organisms. Distinctively, however, the members of Kingdom Protista are all eukaryotic while the members of kingdom Monera are all prokaryotic. Some members of protista are multicellular, however Kingdom protista represents a grab bag, essentially the place where the species are classified when they are not classified as either fungi, animals or plants.

Kingdom Fungi

Unlike protests, the eukaryotic fungi are typically non – aquatic species. They traditionally are nutrients absorbers plus have additional distinctive features. They do exist unicellular fungi, which we call yeast

DOMAIN

The domain is a taxonomic category that, depending on point of view, is either above the level of kingdom or supercedes the kingdom. The domain system contains three members

¾ Eukaryotes (domain Eukarya)

¾ Eubacteria (domain Bacteria)

¾ Archaebacteria (domain Archaea)

Viral classification

Classification of viruses is not nearly as well developed as the classification of cellular organisms. Today viruses tend to be classified by their chemical, morphological and physiological attributes (e.g. genome = DNA vs RNA, virion particle = enveloped vs non-enveloped and myriad details of their intracellular infection cycles). Binomial nomenclature is not employed to name viruses;

instead viruses are named by their common names (e.g., Human Immunodeficiency Virus a.m. HIV) Dichotomous key A means of assigning an organism to a specific taxonomic category typically involves the use of specific criteria that may posed as questions (e.g. What does the organism look like etc.). Relevant criteria may be arranged as a dichotomous key. In a dichotomous

key questions are arranging hierarchically with more general questions are asked first, with questions becoming more specific asked subsequently

EUKARYOTIC CELL

Eu- true

Karyote- nucleus

The eukaryotic cell has a true membrane bound nucleus, usually containing multiple chromosomes, a mitotic apparatus, a well-defined endoplasmic reticulum and mitochondria.

PROKARYOTIC CELL

Pro- primitive

Karyote- nucleus

The prokaryotic cell possesses naked DNA with out associated basic proteins, divides a mitotically by binary fission and bounded by a semi rigid cell wall.

Bacterial Cell

General property:

- Typical prokaryotic cell
- Contain both DNA and RNA
- Most grow in artificial media
- Replicate by binary fission
- Almost all contain rigid cell wall
- Sensitive to antimicrobial agent

STRUCTURE OF BACTERIA

Bacterial structure is considered at three levels.

1. Cell envelope proper: Cell wall and cell membrane.
2. Cellular element enclosed with in the cell envelope: Mesosomes, ribosomes, nuclear apparatus, polyamines and cytoplasmic granules.
3. Cellular element external to the cell envelope: Flagellum, Pilus and Glycocalyx.

Cell envelope proper

A. Cell wall Multi layered structure and constitutes about 20% of the bacterial dry weight. Average thickness is 0.15-0.5 am. Young and rapidly growing bacteria has thin cell wall but old and slowly dividing bacteria has thick cell wall.

It is composed of N-acetyl Muramic acid and N-acetyl Glucosamine back bones cross linked with peptide chain and pentaglycine bridge.

Components of cell wall of Gram-negative bacteria

1. Peptidoglycan
2. Lipoprotein
3. Phospholipid

4. Lipopolysaccharide

Components of cell wall of Gram-positive bacteria

1. Peptidoglycan
2. Teichoic acid

Functions of cell wall

1. Provides shape to the bacterium
2. Gives rigidity to the organism

3. Protects from environment

4. Provides staining characteristics to the bacterium

5. Contains receptor sites for phages/complements

6. Site of action of antibody and colicin

7. Contains toxic components to host Bacteria with defective cell walls Bacteria with out cell wall can be induced by growth in the presence of antibiotics and a hypertonic environment to prevent lysis.

They are of three types:

1. Protoplasts: Derived from Gram-positive bacteria and totally lacking cell walls; unstable and osmotically

fragile; produced artificially by lysozyme and hypertonic medium: require hypertonic conditions for maintenance.

2. Spherules: Derived from Gram-negative bacteria;

retain some residual but non-functional cell wall material; osmotically fragile; produced by growth with penicillin and must be maintained in hypertonic medium.

L- forms: Cell wall-deficient forms of bacteria usually produced in the laboratory but sometimes spontaneously formed in the body of patients treated with penicillin; more stable than protoplasts or spherulites, they can replicate in ordinary media.

B. Cell membrane

Also named as cell membrane or cytoplasmic membrane

It is a delicate trilaminar unit membrane.

It accounts for 30% of the dry weight of bacterial cell.

It is composed of 60% protein, 20-30% lipids and 10-20% carbohydrate.

Function of cell membrane

1. Regulates the transport of nutrients and waste products into and out of the cell.
2. Synthesis of cell wall components
3. Assists DNA replication
4. Secrets proteins
5. Carries on electron transport system
6. Captures energy in the form of ATP
7. Cellular element enclosed with in the cell envelope

A. Mesosomes

Convoluted invagination of cytoplasmic membrane often at sites of septum formation.

It is involved in DNA segregation during cell division and respiratory enzyme activity.

B. Ribosomes

Cytoplasmic particles which are the sites of protein synthesis.

It is composed of RNA (70%) and proteins (30%) and constitutes 90% of the RNA and 40% of the total protein.

The ribosome monomer is 70s with two subunits, 30s and 50s.

Polyamines

They are of three types

- Putrescin
- Spermidine
- Spermine

It is found in association with bacterial DNA, ribosomes and cell membrane.

Function of polyamines

1. Antimutagenic
2. Prevent dissociation of 70s ribosome into subunits.
3. Increase resistance of protoplast lysis.

Cytoplasmic granules

represent accumulated food reserves.

- Nature of granules
- Glycogen
- Poly-beta hydroxy butyrate
- Babes-Ernst (Volutid)

Nuclear apparatus

Well defined nucleus and nuclear membrane, discrete chromosome and mitotic apparatus are not present in bacteria; so nuclear region of bacteria is named as nuclear body, nuclear apparatus and nucleoid.

Bacterial genome consists of single molecule of double stranded DNA arranged in a circular form.

Besides nuclear apparatus, bacteria may have extra chromosomal

genetic material named as plasmids. Plasmids do not play any role in the normal function of the bacterial cell but may confer certain additional properties (E.g. Virulence, drug

resistance) which may facilitate survival and propagation of the micro- organism.

3. Cellular element external to the cell envelope

A. Glycocalyx (capsule and slime layer) Capsule is gel firmly adherent to cell envelope. Slime is gel easily washed off from cell envelope.

All bacteria have at least a thin slime layer.

Capsule is composed of polysaccharide and protein (D-Glutamate of Bacillus anthracis)

Features of capsule

1. Usually weakly antigenic.
2. Not necessary for viability.
3. Endows virulence.
4. Protects from phagocytosis.
5. Capsulated strains are invariably non-motile.
6. Visualized by negative staining and capsule staining.
7. Detected by quelling phenomenon.

B. Flagellum

It is the organ of locomotion in bacterial cell and consists of thee parts. These are. The filament

- The hook
- The basal body

The basal body and hook are embedded in the cell surface while the filament is free on the surface of bacterial cell.

Their presence in bacterial cell is detected by

- Hanging drop preparation
- Swarming phenomenon on surface of plate agar
- Motility media
- Special staining methods
- Silver impregnation methods
- Dark –field microscopy
- Electron microscopy

Size: 3-20µm in length and 0.01-0.013µm in diameter.

It is composed of protein named as flagellin.

The flagellar antigen in motile bacterium is named as H (Haunch) antigen.

Flagellar arrangements

1. Atrichias: Bacteria with no flagellum.

2. Monoicous: Bacteria with single polar flagellum.

3. Ophiotrichids: Bacteria with bunch of flagella at one pole.

4. Amphitricha: Bacteria with flagella at both poles.

5. Peritrichous: Bacteria with flagella all over their surface.

End flagella (axial filament)

It is the organ of motility found in periplasmic space of spirochetes.

C. Pili (fimbriae)

It is hair like structure composed of protein (pilin)

Two types (Based on function)

- . Common pili: The structure for adherence to cell surface.
- Sex pili: The structure for transfer of genetic material from the

donor to the recipient during the process of conjugation.

D. Spores

Resting cells which are capable of surviving under adverse environmental conditions like heat, drying, freezing, action of toxic chemicals and radiation. Bacterial spore is smooth walled and oval or spherical in shape. It does not take up ordinary stains. It looks like areas of high refractivity under light microscope.

It is significant in spread of disease and indicator of sterility of

materials.

Spores are detected by

- . Simple staining methods
- Special staining methods

Arrangements of spores

1. No bulging of cell wall

- . Oval central
- . Oval sub terminal
- Spherical central

2. Bulging of cell wall

- Oval sub terminal
- Oval terminal
- Spherical terminal
- Free spore

Classification of bacteria

Bacterial classification depends on the following characteristics.

1. Morphology and arrangement

2. Staining

3. Cultural characteristics

4. Biochemical reactions

5. Antigenic structure

6. Base composition of bacterial DNA

Morphology and staining of bacteria are the commonly used characteristics to classify bacteria.

1. Morphology of bacteria

When bacteria are visualized under light microscope, the following morphology is seen.

1. Cocci (singular coccus): Round or oval bacteria measuring about 0.5-1.0µmb in diameter. They are found in single, pairs, chains or clusters.

2. Bacilli (singular bacillus): Stick-like bacteria with rounded, tapered, square or swollen ends; with a size measuring 1-10µm in length by 0.3-1.0µm in width.

3. Coccobacilli (singular coccobacillus): Short rods.

4. Spiral: Spiral shaped bacteria with regular or irregular distance between twisting.

E.g. Spirilla and spirochetes

Staining of bacteria

Bacterial staining is the process of coloring of colorless bacterial structural components using stains (dyes). The principle of staining is to identify microorganisms selectively by using dyes, fluorescence and radioisotope emission. Staining reactions are made possible because of the physical phenomena of capillary osmosis, solubility, adsorption, and absorption of stains or dyes by cells of microorganisms. Individual variation in the cell wall constituents among different groups of bacteria will consequently produce variations in

colors during microscopic examination. Nucleus is acidic in character and hence, it has greater affinity for basic dyes. Whereas, cytoplasm is basic in character and
has greater affinity for acidic dyes.

There are many types of affinity explaining this attraction force:

1. hydrophobic bonding
2. reagent-cell interaction
3. reagent-reagent interaction
4. ionic bonding
5. hydrogen bonding
6. covalent bonding

Why are stains not taken up by every microorganism?

Factors controlling selectivity of microbial cells are:

1. number and affinity of binding sites
2. rate of reagent uptake
3. rate of reaction
4. rate of reagent loss (differentiation or regressive staining)

Properties of dyes

Why dyes color microbial cells?

Because dyes absorb radiation energy in visible region of electromagnetic spectrum i.e., "light" (wave length 400-650). And absorption is anything outside this range it is colorless. E.g., acid
fuchsin absorbs blue green and transmit red.

General methods of staining

1. Direct staining

Is the process by which microorganisms are stained with simple?
dyes. E.g., methylene blue

2. Indirect staining – is the process which needs mordants. A mordant is the substance which, when taken up by the microbial cells helps make dye in return, serving as a link or bridge to make the staining recline possible. It combines with a dye to form a colored "lake", which in turn combines with the microbial cell to form a "cell-mordant-dye complex". It is an integral part of the staining reaction itself, without which no staining could possibly occur. E.g., iodine.

A mordant may be applied before the stain or it may be included as part of the staining technique, or it may be added to the dye solution itself.

An accentuator, on the other hand is not essential to the chemical union of the microbial cells and the dye. It does not participate in the staining reaction, but merely accelerate or hasten the speed of the staining reaction by increasing the staining power and selectivity of the dye. Progressive staining - is the process whereby microbial cells are stained in a definite sequence, in order that a satisfactory differential coloration of the cell may be achieved at the end of the correct time with the staining solution. Regressive staining - with this technique, the microbial cell is first over stained to obliterate the cellular desires, and the excess stain is removed or decolorized from unwanted part. **Differentiation (decolorization)**

- is the selective removal of excess stain from the tissue from microbial cells during regressive staining in order that a specific substance may be stained differentially from the surrounding cell. Differentiation is usually controlled visually by examination under the microscope

Uses

1. To observe the morphology, size, and arrangement of bacteria.
2. To differentiate one group of bacteria from the other group.

Biological stains are dyes used to stain micro-organisms.

Types of microbiological stains

- Basic stains
- Acidic stains
- Neutral stains

NB: This classification is not based on PH

of stains.

Basic stains are stains in which the coloring substance is contained in the base part of the stain. The acidic part is colorless. E.g. Acidic stains are stains in which the coloring substance is contained in the acidic part of the stain. The base part is colorless. It is not commonly used in microbiology laboratory.

E.g. Eosin stain

Neutral stains are stains in which the acidic and basic components of stain are colored.

Neutral dyes stain both nucleic acid and cytoplasm. E.g. Giemsa stain

Types of staining methods

1. Simple staining method
2. Differential staining method
3. Special staining method

1. Simple staining method

It is type of staining method in which only a single dye is used. Usually used to demonstrate bacterial morphology and arrangement

Two kinds of simple stains

1. Positive staining: The bacteria or its parts are stained by the

dye.

E.g. Carbol fuchsin stain

Methylene blue stain

Crystal violet stain

Procedure:

- . Make a smear and label it.
- . Allow the smear to dry in air.
- . Fix the smear over a flame.
- . Apply a few drops of positive simple stain like 1% methylene blue, 1% carbolfuchsin or 1% gentian violet for 1 minute.
- Wash off the stain with water.
- Air-dry and examine under the oil immersion objective.

2. Negative staining: The dye stains the background and the

bacteria remain unstained. E.g. Indian ink stain Negros in stain

Differential staining method Multiple stains are used in differential staining method to distinguish different cell structures and/or cell types. E.g. Gram stain and ZiehlNeelson stain

A. Gram staining method

Developed by Christian Gram. Most bacteria are differentiated by their gram reaction due to differences in their cell wall structure. Gram-positive bacteria are bacteria that stain purple with crystal violet after decolorizing with acetone-alcohol. Gram-negative bacteria

are bacteria that stain pink with the counter stain (safranin) after losing the primary stain (crystal violet) when treated with acetone-alcohol.

Required reagents:

- Gram's Iodine
- Acetone-Alcohol
- Safranin

Procedure:

1. Prepare the smear from the culture or from the specimen.
2. Allow the smear to air-dry completely.
3. Rapidly pass the slide (smear upper most) three times through the flame.
4. Cover the fixed smear with crystal violet for 1 minute and wash with distilled water.
5. Tip off the water and cover the smear with gram's iodine for 1 minute.
6. Wash off the iodine with clean water.
7. Decolorize rapidly with acetone-alcohol for 30 seconds.
8. Wash off the acetone-alcohol with clean water.
9. Cover the smear with safranin for 1 minute.
10. Wash off the stain wipe the back of the slide. Let the smear to air-dry.
11. Examine the smear with oil immersion objective to look for bacteria.

Interpretation:

- Gram-positive bacterium ……Purple
- Gram-negative bacterium ……. Pink

B. Ziehl-Neelson staining method

Developed by Paul Ehrlichin1882, and modified by Ziehl and Nelson Ziehl-Neelson stain (Acid-fast stain) is used for staining Mycobacteria which are hardly stained by gram staining method. Once the Mycobacteria is stained with primary stain it can not be decolorized with acid, so named as acid-fast bacteria.

Reagents required:

- Carbol-fuchsin
- Acid-Alcohol
- Methylene blue/Malachite green

Procedure for Ziehl-Neelson staining method

1. Prepare the smear from the primary specimen and fix it by passing through the flame and label clearly
2. Place fixed slide on a staining rack and cover each slide with concentrated carbol fuchsin solution.
3. Heat the slide from underneath with sprit lamp until vapor rises (do not boil it) and wait for 3-5 minutes.
4. Wash off the stain with clean water.
5. Cover the smear with 3% acid-alcohol solution until all color is removed (two minutes).
6. Wash off the stain and cover the slide with 1% methylene blue. For one minute.
7. Wash off the stain with clean water and let it air-dry.
8. Examine the smear under the oil immersion objective to look for acid fast bailli.

Interpretation:

Acid fast bacilli……. Red

Back ground……Blue

Reporting system

0 AFB/100 field ……No AFB seen

1-2 AFB/ 300 field……. Scanty

1-10 AFB/100 field……1+

11-100AFB/100 field.……2+

1-10 AFB/field…… ……3+

>10 AFB/field…… ….4+

NB: AFB means number of acid-fast bacilli seen.

3. Special stains

a. Spore staining method

b. Capsule staining method

Procedure:

1. Prepare smear of the spore-forming bacteria and fix in flame.

2. Cover the smear with 5% malachite green solution and heat over steaming water bath for 2-3 minutes.

3. Wash with clean water.

4. Apply 1% safranin for 30 seconds.

5. Wash with clean water.

6. Dry and examine under the oil immersion objective.

b. Capsule staining method: Welch method

Procedure:

1. Prepare smear of capsulated bacteria.

2. Allow smear to air-dry; do not fix the smear.

3. Cover the smear with 1% aqueous crystal violet for 1 minute over steaming water bath.

4. Wash with 20% copper sulfate solution. Do not use water.

5. examine under the oil immersion objective.

CULTIVATION OF BACTERIA IN CULTURE MEDIA

Culture media

It is the media containing the required nutrients for bacterial growth.

Uses: Isolation and identification of micro-organisms

- Performing anti-microbial sensitivity tests Common ingredients of culture media
- Peptone
- Meat extract
- Yeast extract
- Mineral salts
- Carbohydrates
- Agar
- Water

Peptone: Hydrolyzed product of animal and plant proteins: Free amino acids, peptides and proteases (large sized peptides).

It provides nitrogen; as well carbohydrates, nucleic acid fractions, minerals and vitamins.

Meat extract: supply amino acids, vitamins and mineral salts.

Yeast extract: It is bacterial growth stimulants.

Mineral salts: these are: Sulfates as a source of sulfur.

- Phosphates as a source of phosphorus.
- Sodium chloride
- Other elements

Carbohydrates: Simple and complex sugars are a source of carbon and energy.

- Assist in the differentiation of bacteria.

E.g. Sucrose in TCBS agar differentiates vibrio species.

Lactose in MacConkey agar differentiates enterobacteria.

Agar: It is an inert polysaccharide of seaweed.

It is not metabolized by micro-organism.

Property

It has high gelling strength

high melting temperature (90-95 o

c) . low gelling temperature

- It forms firm gel at 1.5% W/V concentration.
- It forms semisolid gel at 0.4-0.5% W/V concentration.

Uses:

Solidify culture media

May provide calcium and organic ions to inoculated bacteria. Water Deionized or distilled water must be used in the preparation of culture media.

Types of culture media

- Basic /Simple /. To prepare enriched media
- . To maintain stock cultures of control bacterial strains
- . To subculture pathogenic All-purpose media

It is a media that supports the growth of micro-organisms that do not require special nutrients.

Uses:

bacteria from selective/differential medium prior to performing biochemical or serological tests.

E.g. Nutrient Broth, Nutrient Agar

2. Enriched media

Media that are enriched with whole blood, lazed blood, serum, special extracts or vitamins to support the growth of pathogenic bacteria.

E.g. Blood Agar, Chocolate Agar

3. Enrichment media

Fluid media that increases the numbers of a pathogen by containing enrichments and/or substances that discourage the multiplication of unwanted bacteria.

E.g. Selenite F broth media Alkaline peptone water

4. Selective media

Media which contain substances (E.g. Antibiotics) that prevent or slow down the growth of bacteria other than pathogens for which the media are intended.

E.g. Modified Thayer –Martin Agar

Salmonella-Shigella (SS) agar

1. Differential media

Media to which indicator substances are added to differentiate bacteria.

E.g. TCBS Agar differentiates sucrose fermenting yellow colonies of Vibrio cholerae to non-sucrose fermenting blue colonies other Vibrio species.

NB: Most differential media distinguish between bacteria by an indicator which changes color when acid is produced following carbohydrate fermentation.

2. Transport media

Media containing ingredients to prevent the overgrowth of commensals and ensure the survival of pathogenic bacteria when specimens cannot be cultured soon after collection.

3. Enrichment media

Fluid media that increases the numbers of a pathogen by containing enrichments and/or substances that discourage the multiplication of unwanted bacteria.

E.g. Selenite F broth media Alkaline peptone water

4. Selective media

Media which contain substances (E.g. Antibiotics) that prevent or slow down the growth of bacteria other than pathogens for which the media are intended.

E.g. Modified Thayer –Martin Agar Salmonella-Shigella (SS) agar

Choice of culture media

The selection culture media will depend on:

1. The major pathogens to be isolated, their growth requirements and the features by which they are recognized.

2. Whether the specimens being cultured are from sterile sites or from sites having normal microbial flora.

3. The cost, availability and stability of media.

4. The training and experience of laboratory staff in preparing, using and controlling culture media.

Forms of culture media

1. solid culture media

2. semisolid culture media

3. Fluid culture media

1. solid culture media

. Plate cultures in petri dishes

. stab/slope cultures in tubes and bottles

Uses: Description of bacterial colonies

- size: diameter in mm
- Out line: circular, entire, wavy, indented

  Elevation: flat, raised, low convex and dome shaped.
- Transparency: transparent, opaque, and translucent.
- Surface: smooth (mucoid) and shiny, rough and dull.
- Color: colorless, white, pink, and pigmented
- changes in medium

E.g. Hemolysis in Blood Agar

Blackening of medium due to hydrogen sulfide production.

2. Semisolid culture media

Uses:

. as an enrichment media

. as motility media

3. Fluid culture media

Bacterial growth in fluid media is shown by a turbidity in the medium.

Uses:

. as an enrichment media

. as biochemical testing media

. as blood culture media

Preparation of culture media

Culture media contains essential ingredients for microbial growth requirements. For successful isolation of pathogens, culture media must be prepared carefully.

Most culture media are available commercially in ready –made dehydrated form.

The major processes during preparation of culture media

- Weighing and dissolving of culture media ingredients
- Sterilization and sterility testing
- Addition of heat-sensitive ingredients
- Dispensing of culture media
- pH testing of culture media
- Quality assurance of culture media
- Storage of culture media

1. Weighing and dissolving of culture media ingredients

Apply the following while weighing and dissolving of culture media ingredients

- Use ingredients suitable for microbiological use.
- Use clean glass ware, plastic or stainless-steel equipment.
- Use distilled water from a glass still.

- Do not open new containers of media before finishing previous ones.
- Weigh in a cool, clean, dry and draught-free atmosphere.
- Weigh accurately using a balance.
- Wear a facemask and glove while weighing and dissolving toxic chemicals.
- Do not delay in making up the medium after weighing.
- Add powdered ingredients to distilled water and mix by rotating or stirring the flask.
- Stir while heating if heating is required to dissolve the medium.
- Autoclave the medium when the ingredients are dissolved.

2. Sterilization and sterility testing

Always sterilize a medium at the correct temperature and for the correct length of time as instructed in the method of preparation.

Methods used to sterilize culture media

A) . Autoclaving

B) . Steaming to 100 OC

C) . Filtration

A) Autoclaving

Autoclaving is used to sterilize most agar and fluid culture media.

B) Steaming at 100 OC

It is used to sterilize media containing ingredients that would be inactivated at temperature over 100 OC and re-melt previously bottled sterile agar media.

C) Filtration

It is used to sterilize additives that are heat-sensitive and cannot be autoclaved.

Sterility testing

The simplest way to test for contamination is to incubate the prepared sample media At 35-37 OC for 24 hours. Turbidity in fluid media and microbial growth in solid media confirm contamination.

3. Addition of heat-sensitive ingredients Refrigerated-heat sensitive ingredients should be warmed at room temperature before added to a molten agar medium. Using an aseptic technique, the ingredients should be added when the medium has cooled to 50 OC, and should be distributed immediately unless further heating is required.

4. pH testing

The pH of most culture media is near neutral, and can be tested using pH papers or pH meter.

5. Dispensing of culture media

Media should be dispensed in a clean draught-free room using aseptic technique and sterile container.

Dispensing agar media in Petridis

- Lay out the sterile Petri dishes on a level surface.
- Mix the medium gently by rotating the flask or bottle.
- Flame sterilize the neck of flask or bottle.
- Pour 15 ml of medium in each Petridis.
- Stack the plates after the medium has gelled or cooled.

Store the plates in a refrigerator.

NB: Agar plates should be of an even depth and of a firm gel.

The surface of the medium should be smooth and free from bubbles.

6. Quality control

• Inoculate quarter plates of the medium with a five hours broth culture for each control organism.

• Use a straight wire to inoculate and wire loop to spread the inoculum.

• Depending on the species, incubate aerobically, CO2-enriched atmosphere and anaerobically at 35-37 OC for 24 hours.

• Examine for the degree of growth, morphology and other characteristics of microbial colonies.

• Record the result of each control species and compare to your standard reading.

Storage of culture media

• Dehydrated culture media and dry ingredients should be stored at an even temperature in a cool dry place away from direct light.

• Plates of culture media, and additives like serum, blood and antimicrobials in solid form require storage at 2-8 OC.

• Antimicrobials in solution form should be stored at –20 OC.

• All culture media and additives should be labeled with the name and date of preparation.

Inoculation of culture media

When inoculating culture media, an aseptic technique must be used to prevent contamination of specimens and culture media, and laboratory worker and the environment.

Aseptic technique during inoculation of culture media

• Decontaminate the workbench before and after the work of the day.

• Use facemask and gloves during handling highly infectious specimens.

• Flame sterilize wire loops, straight wires, and metal forceps before and after use.

• Flame the neck of specimen and culture bottles, and tubes after removing and before replacing caps and plugs.

Inoculation of media in Petri dishes

The inoculation of media in Petri dishes is named as 'plating out' or 'looping out'. Before inoculating a plate of culture media, dry the surface of the media by incubating at 37 OC for 30 minutes. To inoculate a plate, apply the inoculum to a small area of the plate ('the well') using sterile wire loop and then spread and thin out the inoculum to ensure single colony growth. Inoculation of butt and slant media to inoculate butt and slant media, use a sterile straight wire to stab into the butt and then streak the slant in a zigzag pattern.

Inoculation of slant media

To inoculate slant media, use a straight wire to streak the inoculum down the center of the slant and then spread the inoculum in a zigzag pattern.

Inoculation of stab media

To inoculate stab media, use a straight wire to stab through the center of the medium and withdraw the wire along the line of inoculum. Inoculation of fluid media to inoculate fluid media, use straight wire or wire loops.

Incubation of cultures

Inoculated media should be incubated as soon as possible.

Optimal temperature, humidity and gaseous atmosphere should be provided for microorganisms to grow best. The temperature selected for routine culturing is 35-37 OC. Some pathogens require CO2-enriched atmosphere to grow in culture media, and the simplest way to provide CO2-enriched atmosphere is to enclose a lighted candle in an airtight jar which provides 3-5% CO2 by the time the candle is extinguished. Anaerobic atmosphere is essential for the growth of strict anaerobes, and the techniques for obtaining anaerobic conditions are the following:

. Anaerobic jar with a gas generating kit.

. Reducing agents in culture media.

BACTERIAL NUTRITION

Bacteria, like all cells, require nutrients for the maintenance of their metabolism and for cell division. Bacterial structural components and the macromolecules for the metabolism are synthesized from the elements. The four most important elements of bacteria are carbon, hydrogen, oxygen and nitrogen. Carbon Organisms require a source of carbon for the synthesis of numerous organic compounds that comprise protoplast.

Depending on their requirements, bacteria can be classified as

1. Autotrophs: Free-living, non-parasitic bacteria which use carbon dioxide as carbon source.

The energy needed for their metabolism can be obtained from: Sun Light-Photoautotrophs

. Inorganic compounds by oxidation-Chemoautotrophs

3. Heterotrophs: Parasitic bacteria require more complex organic compounds as their source of carbon and energy. Human pathogenic bacteria are heterotrophs. The principal source of carbon is carbohydrate which are degraded either by oxidation, in the presence of oxygen, or by fermentation, in the absence of oxygen, to provide energy in the form of ATP.

Hydrogen and oxygen

- Obtained from water.
- Essential for the growth and maintenance of cell.

Nitrogen

- Constitutes 10% of dry weight of bacterial cell.
- Obtained from organic molecules like proteins and inorganic molecules like ammonium salts and nitrates.

NB: Main source of nitrogen is ammonia, in the form of ammonium salt.

Growth factors

Growth factors are organic compounds that are required by microorganisms in small amounts which the cell cannot synthesize from other carbon source. These are amino acids, purines and pyrimidines, and vitamins.

Prototroph: Wild-type bacteria with normal growth requirements.

Auxotroph's: Mutant bacteria, which require an additional growth factor not needed by the parental or wild type strain.

SRI LAKSHMI NARAYANA INSTITUTE OF ALLIED HEALTH SCIENCE

MEDICAL EDUCATIONAL PROJECT

CLINICAL MICROBIOLOGY- VAC05/AHS/2020-06/01

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15	TIOLEODOSS A	UAH1901128	
16	UMAMAHESWARI S	UAH1901129	
17	YOGASRI V	UAH1901130	
18	AMARNATH K	UAH1906101	
19	CHANDRA SEKAR M	UAH1906102	
20	EZHILARASAN M	UAH1906103	
21	JEEVA J	UAH1906104	
22	PAVITHRA P	UAH1906105	
23	PRAVEEN KUMAR R	UAH1906106	
24	SANTHIYA S	UAH1906107	
25	SELVAPRIYA S	UAH1906108	
26	SHAJAKHAN	UAH1906109	
27	SOORIYA A	UAH1906110	
28	SUJITH G	UAH1906111	
29	THULASIRAMAN	UAH1906112	
30	VIGNESH S	UAH1906113	

SRI LAKSHMI NARAYANA INSTITUTE OF ALLIED HEALTH SCIENCE

MEDICAL EDUCATIONAL PROJECT

CLINICAL MICROBIOLOGY- VAC05/AHS/2020-06/01

S.No.	Name of the Students	University Register Number	Signature
1	PAVITHRA S	UAH1901114	
2	POOVARASAN P	UAH1901115	
3	PRAVEEN KUMAR E	UAH1901116	
4	RAMYA R	UAH1901117	
5	SANJAI B	UAH1901118	
6	SELVAKUMAR R	UAH1901119	
7	SENTHIL RAJA D	UAH1901120	
8	SHALINI R	UAH1901121	
9	SHURUTHY S	UAH1901122	
10	SINDHUJA P	UAH1901123	
11	SHIVA JOTHI S	UAH1901124	
12	SOUNDARYA M	UAH1901125	
13	SRIRAM A	UAH1901126	
14	THIRUMURUGAN A	UAH1901127	
15	TIOLEODOSS A	UAH1901128	
16	UMAMAHESWARI S	UAH1901129	
17	YOGASRI V	UAH1901130	
18	AMARNATH K	UAH1906101	
19	CHANDRA SEKAR M	UAH1906102	
20	EZHILARASAN M	UAH1906103	
21	JEEVA J	UAH1906104	
22	PAVITHRA P	UAH1906105	
23	PRAVEEN KUMAR R	UAH1906106	
24	SANTHIYA S	UAH1906107	
25	SELVAPRIYA S	UAH1906108	
26	SHAJAKHAN	UAH1906109	
27	SOORIYA A	UAH1906110	
28	SUJITH G	UAH1906111	
29	THULASIRAMAN	UAH1906112	
30	VIGNESH S	UAH1906113	

SRI LAKSHMI NARAYANA INSTITUE OF HIGHER EDUCATON AND RESEARCH

Annexure - III

Assessment Form

Sri Lakshmi Narayana Institute of Medical Sciences, Puducherry

COURSE CODE: VAC05/AHS/2020-06/01

Multiple Choice Question ***15x2=30***

1. Which of these bacterial components is least likely to contain useful antigens?

a. Cell wall
b. Flagella
c. Ribosomes
d. Capsule

2. Which of the following contains structures composed of N-acetylmuramic acid and N-acetylglucosamine?

a. Mycoplasmas
b. Amoeba
c. E.coli
d. Spheroplast

3. The association of endotoxin in gram-negative bacteria is due to the presence of

a. Steroids
b. Peptidoglycan
c. Lipopolysaccharides
d. Polypeptide

4. The prokaryotic cell membrane

a. Contains metabolic enzymes
b. Is selectively permeable
c. Regulates the entry and exit of materials
d. Contains proteins and phospholipids

5. Which of the statements regarding gram staining is wrong?

a. *Mycobacterium tuberculosis* stains blue because of the thick lipid layer
b. *Streptococcus pyogenes* stains blue because of a thick peptidoglycan layer
c. *Escherichia coli* stains pink because of a thin peptidoglycan layer
d. *Mycoplasma pneumoniae* is not visible in the Gram's stain because it has no cell wall

6. Which of the following is not a recognised cause of diarrhoea?

a. *Vibrio cholerae*
b. *Escherichia coli*
c. *Clostridium perfringens*
d. *Enterococcus faecalis*

7. Which of the following is a gram-positive eubacteria?

a. *Actinomyces*
b. *Clostridium*
c. *Rhizobium*
d. *Clostridium, Actinomyces*

8. Which of the following microorganisms is not responsible for urinary tract infection?

a. *Proteus mirabilis*
b. *Escherichia coli*
c. *Klebsiella pneumoniae*
d. *Bacteroides fragilis*

9. Which of the following is diagnosed by serologic means?

a. Actinomycosis
b. Q-fever
c. Pulmonary tuberculosis
d. Gonorrhoea

10. Diarrhoea is not caused by

a. *Shigella dysenteries*
b. *Streptococcus pyogenes*
c. *Clostridium difficile*
d. *Salmonella enteritis*

11. The coagulase is done to differentiate

a. *Staphylococcus aureus* from *Staphylococcus epidermidis*
b. *Staphylococcus epidermidis* from *Neisseria meningitidis*
c. *Streptococcus pyogenes* from *Enterococcus faecalis*
d. *Streptococcus pyogenes* from *Staphylococcus aureus*

12. Prokaryotic cells are more resistant to osmotic shock than eukaryotic cells because

a. Their cell wall is composed of peptidoglycan
b. They are selectively permeable
c. They contain osmoregulation porins
d. They block water molecules from entering the cell

13. The bacterial genus where sterols are present in the cell membrane is

a. *Vibrio*
b. *Mycoplasma*
c. *Escherichia*
d. *Chlamydia*

14. The bacterium that infects other gram-negative bacteria is

a. *Proteus mirabilis*
b. *Haemophilus influenza*
c. *Bdellovibrio*
d. *Pseudomonas putida*

15. Which phage is used for phage display technique?

a. T7
b. M13
c. ƛ-phage
d. ϕ6

SRI LAKSHMI NARAYANA INSTITUE OF HIGHER EDUCATON AND RESEARCH

DAMYA .R. UAH1901117

SRI LAKSHMI NARAYANA INSTITUE OF HIGHER EDUCATON AND RESEARCH

Annexure - III

Assessment Form

Sri Lakshmi Narayana Institute of Medical Sciences, Puducherry

COURSE CODE: VAC05/AHS/2020-06/01

Multiple Choice Question ***15x2=30***

1. Which of these bacterial components is least likely to contain useful antigens?

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2. Which of the following contains structures composed of N-acetylmuramic acid and N-acetylglucosamine?

   a. Mycoplasmas
   b. Amoeba
   c. E.coli
   d. Spheroplast

3. The association of endotoxin in gram-negative bacteria is due to the presence of

   a. Steroids
   b. Peptidoglycan
   c. Lipopolysaccharides
   d. Polypeptide

4. The prokaryotic cell membrane

   a. Contains metabolic enzymes
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   c. Regulates the entry and exit of materials
   d. Contains proteins and phospholipids

5. Which of the statements regarding gram staining is wrong?

   a. *Mycobacterium tuberculosis* stains blue because of the thick lipid layer
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   c. *Escherichia coli* stains pink because of a thin peptidoglycan layer
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SRI LAKSHMI NARAYANA INSTITUE OF HIGHER EDUCATON AND RESEARCH

6. Which of the following is not a recognised cause of diarrhoea?

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c. *Streptococcus pyogenes* from *Enterococcus faecalis*
d. *Streptococcus pyogenes* from *Staphylococcus aureus*

SRI LAKSHMI NARAYANA INSTITUE OF HIGHER EDUCATON AND RESEARCH

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b. M13
c. λ-phage
d. ϕ6

SRI LAKSHMI NARAYANA INSTITUE OF HIGHER EDUCATON AND RESEARCH

SELVAKUMAR . K . UAH19011I9

SRI LAKSHMI NARAYANA INSTITUE OF HIGHER EDUCATON AND RESEARCH

Annexure - III

Assessment Form

Sri Lakshmi Narayana Institute of Medical Sciences, Puducherry

COURSE CODE: VAC05/AHS/2020-06/01

Multiple Choice Question ***15x2=30***

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   b. Flagella
   c. Ribosomes
   d. Capsule

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   c. E.coli
   d. Spheroplast

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   c. *Escherichia coli* stains pink because of a thin peptidoglycan layer
   d. *Mycoplasma pneumoniae* is not visible in the Gram's stain because it has no cell wall

SRI LAKSHMI NARAYANA INSTITUE OF HIGHER EDUCATON
AND RESEARCH

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d. *Streptococcus pyogenes* from *Staphylococcus aureus*

SRI LAKSHMI NARAYANA INSTITUE OF HIGHER EDUCATON
AND RESEARCH

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b. *Haemophilus influenza*
c. *Bdellovibrio*
d. *Pseudomonas putida*

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b. M13
c. λ-phage
d. ϕ6

Sri Lakshmi Narayana Institute of Medical Sciences

Affiliated to Bharath Institute of Higher Education & Research

(Deemed to be University under section 3 of the UGC Act 1956)

CERTIFICATE OF MERIT

This is to certify that **Poovarasan P(UAH1901115)** has actively participated in the Value Added Course on **CLINICAL MICROBIOLOGY(VAC05/AHS/2020-06/01)** held during January 2020 – February 2020 Organized by Sri Lakshmi Narayana Institute of Medical Sciences, Pondicherry- 605 502, India.

RESOURCE PERSON

Dr. G.Somasundram

COORDINATOR

Sri Lakshmi Narayana Institute of Medical Sciences

Affiliated to Bharath Institute of Higher Education & Research

(Deemed to be University under section 3 of the UGC Act 1956)

CERTIFICATE OF MERIT

This is to certify that **PAVITHRA S(UAH1901114)** has actively participated in the Value Added Course on **CLINICAL MICROBIOLOGY(VAC05/AHS/2020-06/01)** held during January 2020 – February 2020 Organized by Sri Lakshmi Narayana Institute of Medical Sciences, Pondicherry- 605 502, India.

Dr. G.Somasundram

COORDINATOR

RESOURCE PERSON

Annexure- V

Student Feedback Form

Course Name: "CLINICAL MICROBIOLOGY"

Subject Code: VAC05/AHS/2020-06/01

Name of Student: _____ Roll No.: _____

We are constantly looking to improve our classes and deliver the best training to you. Your evaluations, comments and suggestions will help us to improve our performance

Feedback Form

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
1. The course met my expectations.	○	○	○	○	○
2.I will be able to apply the knowledge learned.	○	○	○	○	○
3.The course objectives for each topic were identified and followed.	○	○	○	○	○
4.The content was organised and easy to follow.	○	○	○	○	○
5.The quality of instruction was good.	○	○	○	○	○
6.Class participation and interaction were encouraged.	○	○	○	○	○
7.Adequate time was provided for questions and discussion.	○	○	○	○	○

8.How do you rate the course overall?

- ○ Excellent
- ○ Good
- ○ Average
- ○ Poor
- ○ Very poor

9. The aspects of the course could be improved?

10. Other comments?

Annexure- V

Student Feedback Form

Course Name: "CLINICAL MICROBIOLOGY"

Subject Code: VAC05/AHS/2020-06/01

Name of Student: R. Selvakumar Roll No.: UAH190111 9,

We are constantly looking to improve our classes and deliver the best training to you. Your evaluations, comments and suggestions will help us to improve our performance

Feedback Form

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
1. The course met my expectations.	✓	○	○	○	○
2.I will be able to apply the knowledge learned.	○	✓	○	○	○
3.The course objectives for each topic were identified and followed.	✓	○	○	○	○
4.The content was organised and easy to follow.	○	✓	○	○	○
5.The quality of instruction was good.	✓	○	○	○	○
6.Class participation and interaction were encouraged.	○	○	✓	○	○
7.Adequate time was provided for questions and discussion.	○	○	✓	○	○

8.How do you rate the course overall?

- ○ Excellent
- ✓ Good
- ○ Average
- ○ Poor
- ○ Very poor

9. The aspects of the course could be improved? Good.

10. Other comments? –

Signature of the student: Selvak R-

Date: 5/2/2020

Annexure- V

Student Feedback Form

Course Name: "CLINICAL MICROBIOLOGY"

Subject Code: VAC05/AHS/2020-06/01

Name of Student: S. SANTHIYA Roll No.: UAH1906107

We are constantly looking to improve our classes and deliver the best training to you. Your evaluations, comments and suggestions will help us to improve our performance

Feedback Form

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
1. The course met my expectations.	○	✓	○	○	○
2.I will be able to apply the knowledge learned.	✓	○	○	○	○
3.The course objectives for each topic were identified and followed.	○	✓	○	○	○
4.The content was organised and easy to follow.	✓	○	○	○	○
5.The quality of instruction was good.	○	✓	○	○	○
6.Class participation and interaction were encouraged.	○	○	✓	○	○
7.Adequate time was provided for questions and discussion.	○	○	✓	○	○

8.How do you rate the course overall?

- ○ Excellent
- ✓ Good
- ○ Average
- ○ Poor
- ○ Very poor

9. The aspects of the course could be improved? improved my knowledge.

10. Other comments? Good.

Signature of the student: Santhiya

Date: 5/02/2020

Date: 05.02.2020

From

Dr.G.Somasundram
Department of Pharmacology,
Sri Lakshmi Narayana Institute of Medical Sciences
Bharath Institute of Higher Education and Research,
Chennai.

Through Proper Channel

To

The Dean,
Sri Lakshmi Narayana Institute of Medical Sciences
Bharath Institute of Higher Education and Research,
Chennai.

Sub: Completion of value-added course: CLINICAL MICROBIOLOGY

Dear Sir,

With reference to the subject mentioned above, the department has conducted the value-added course titled: **CLINICAL MICROBIOLOGY** January to February 2020 for 30 AHS Students. We solicit your kind action to send certificates for the participants that is attached with this letter. Also, I am attaching the photographs captured during the conduct of the course.

Kind Regards,

Dr.G.Somasundram

Encl: Certificates

Photographs

Sri Lakshmi Narayana Institute of Medical Sciences

Date:16-03-2020

From

Dr.G.SOMASUNDRAM
Principal of Allied Health Sciences,
Sri Lakshmi Narayana Institute of Medical Sciences
Bharath Institute of Higher Education and Research,
Chennai.

To

The Dean,
Sri Lakshmi Narayana Institute of Medical College
Bharath Institute of Higher Education and Research,
Chennai.

Sub: Permission to conduct value-added course: CSSD

Dear Sir,

With reference to the subject mentioned above, the department proposes to conduct a value-added course titled CSSD from April to May 2020 . We solicit your kind permission for the same.

Kind Regards

Dr.G.Somasundram

FOR THE USE OF DEANS OFFICE

Names of Committee members for evaluating the course:

The Dean: **Dr. Balagurunathan. K**

The HOD: **Dr. Somasundram. G**

The Expert: **Dr. Manjunath**

The committee has discussed about the course and is approved.

Dean	Subject Expert	HOD
(Sign & Seal)	(Sign & Seal)	(Sign & Seal)

Dr. G. JAYALAKSHMI, BSC., MBBS., DTCD., M.D.,
DEAN
Sri Lakshmi Narayana Institute of Medical Sciences
Osudu, Agaram, Kudapakkam Post,
Villianur Commune, Puducherry - 605502.

PRINCIPAL
Allied Health Sciences
Sri Lakshmi Narayana Institute of Allied Health Sciences
Osudu, Agaram Post, Puducherry - 605 502.

OFFICE OF THE DEAN

Sri Lakshmi Narayana Institute of Medical Sciences

OSUDU, AGARAM VILLAGE, VILLIANUR COMMUNE, KUDAPAKKAM POST,
PUDUCHERRY - 605 502.
[Recognised by Medical Council of India, Ministry of Health letter No. U/12012/249/2005-ME (P -II) dt. 11/07/2011]
[Affliated to Bharath University, Chennai - TN]

Circular

01.03.2020

Sub: Organizing Value-added Course: "sterilization techniques ".reg

With reference to the above-mentioned subject, it is to bring to your notice that Sri Lakshmi Narayana Institute of Medical Sciences, **Bharath Institute of Higher Education and Research** is organizing **"CSSD"**. The course content and registration form is enclosed below."

The application must reach the institution along with all the necessary documents as mentioned. The hard copy of the application should be sent to the institution by registered/ speed post only so as to reach on or before April to May 2020 Applications received after the mentioned date shall not be entertained under any circumstances.

Dean

Dr. G. JAYALAKSHMI, BSC., MBBS., DTCD., M.D.,
DEAN
Sri Lakshmi Narayana Institute of Medical Sciences
Osudu, Agaram, Kudapakkam Post,
Villianur Commune, Puducherry - 605502.

Encl: Copy of Course content

VALUE ADDED COURSE

1. Name of the programme & Code

"Sterilization techniques"

2. Duration & Period

30 hrs. &

3. Information Brochure and Course Content of Value-Added Courses

Enclosed as Annexure- I

4. List of students enrolled

Enclosed as Annexure- II

5. Assessment procedures:

Assessment - *Enclosed as Annexure- III*

6. Certificate model

Enclosed as Annexure- IV

7. No. of times offered during the same year:

1 time July to August 2017

8. Year of discontinuation:

9. Summary report of each program year-wise

Value Added Course- July to August 2017					
Sl. No	**Course Code**	**Course Name**	**Resource Persons**	**Target Students**	**Strength & Year**
1		Sterilization techniques	**DR.MANJUNATH**	AHS	25 & APRIL TO MAY 2020

10. Course Feed Back

Enclosed as Annexure- V

RESOURCE PERSON

COORDINATOR
Dr.G. Somasundaram

PRINCIPAL
Allied Health Sciences
Sri Lakshmi Narayana Institute of Allied Health Sciences
Osudu, Agaram Post, Puducherry - 605 502.

Course Proposal

Course Title: "**sterilization techniques"**

Course Objective:

1. To enhance the performance skill in sterilization techniques.
2. To assess the objectives and protocols in sterilization techniques.
3. To assess the reaction of target allied Health students towards the Basic and Advanced cardiac life support by getting their feedback.

Course Outcome: Improvement in the "sterilization techniques"
Course Audience: Students of AHS Batch
Course Coordinator: Dr.G. Somasundaram
Course Faculties with Qualification and Designation:
1.Course Curriculum/Topics with schedule (Min of 30 hours)

SlNo	Date	Topic	Time	Hours
1.	16.04.2020	Introduction to sterilization techniques, Background, Objectives,	4-5p.m	1
2.	17.04.2020	Ionizing sterilizers	2-3p.m	1
3.	18.04.2020	Dry heat sterilizers	4-6p.m	2
4.	21.04.2020	Liquid chemicals used for sterilization	4-6p.m	2
5.	22.04.2020	microwave	4-6p.m	2
6.	23.04.2020	Gas bead sterilizers	4-5p.m	2
7.	24.04.2020	conventional didactic lecture and video	4-5P.M	1
8.	25.04.2020	Vaporized hydrogen peroxide	4-5p.m	1
9.	23.04.2020	Formaldehyde steam	4-6p.m	1
10.	27.04.2020	Gaseous chloride dioxide	4-6p.m	2
11.	28.04.2020	Safe Handling of Sharps, needles and management of needle stick injuries	4-6p.m	1
12.	29.04.2020	Infrared radiation	4-6p.m	2
13.	30.04.2020	Pre course and Post Course evaluation	2-5p.m	3
		Practical Class I		
13.	02.05.2020	Steps model explanation and various performance assessment methods		1
14.	04.05.2020	Orientation of the students about the training program and assessment methodology by DOPS		1
15.	05.05.2020	Video demonstration of sterilization techniques		2

16.	06.05.2020	Sterilization techniques procedure by STEPS model		2
17.	9.05.2020	Assessment by DOPS procedure and giving feedback in weaker areas	2-6p.m	4
		Total		30 hrs

REFERENCE BOOKS:

1. Miller GE(1990), The assessment of clinical skills/competence/performance. Academic medicine, 65(9), 63-67.

2. Syndneysmee ABC of skill learning BMJ 2003; 326.703-706.

3. Biomedical Waste Management & Handling Rules (2016) with Amendment, updated on 2018.

4. BangBangal V. Training and assessment of medical interns using “direct observation of procedural skills (DOPS)” tool in obstetrics and gynecology.*MOJ Womens Health.* 2018;7(4):120–123. DOI: 10.15406/mojwh.2018.07.00181al V. Training and assessment of medical interns using “direct observation of procedural skills (DOPS)” tool in obstetrics and gynecology. *MOJ Womens Health.* 2018;7(4):120–123. DOI: 10.15406/mojwh.2018.07.00181

CSSD

- **Sterilization** refers to any process that removes, kills, or deactivates all forms of life (in particular referring to microorganisms such as fungi, bacteria, spores, unicellular eukaryotic organisms such as Plasmodium, etc.) and other biological agents like prions present in a specific surface, object or fluid, for example food or biological culture media.
- Sterilization can be achieved through various means, including heat, chemicals, irradiation, high pressure, and filtration. Sterilization is distinct from disinfection, sanitization, and pasteurization, in that those methods reduce rather than eliminate all forms of life and biological agents present. After sterilization, an object is referred to as being sterile or aseptic.

Ionizing Radiation

- Sterilization by ionizing radiation, primarily by cobalt 60 gamma rays or electron accelerators, is a low-temperature sterilization method that has been used for a number of medical products (e.g., tissue for transplantation, pharmaceuticals, medical devices).
- There are no FDA-cleared ionizing radiation sterilization processes for use in healthcare facilities.
- Because of high sterilization costs, this method is an unfavorable alternative to ETO and plasma sterilization in healthcare facilities but is suitable for large-scale sterilization.
- Some deleterious effects on patient-care equipment associated with gamma radiation include induced oxidation in polyethylene and delamination and cracking in polyethylene knee bearings.

Dry-Heat Sterilizers

- This method should be used only for materials that might be damaged by moist heat or that are impenetrable to moist heat (e.g., powders, petroleum products, sharp instruments).
- The advantages for dry heat include the following: it is nontoxic and does not harm the environment; a dry heat cabinet is easy to install and has relatively low operating costs; it penetrates materials; and it is noncorrosive for metal and sharp instruments.
- The disadvantages for dry heat are the slow rate of heat penetration and microbial killing makes this a time-consuming method. In addition, the high temperatures are not suitable for most materials
- The most common time-temperature relationships for sterilization with hot air sterilizers are 170°C (340°F) for 60 minutes, 160°C (320°F) for 120 minutes, and 150°C (300°F) for 150 minutes. *B. atrophaeus* spores should be used to monitor the sterilization process for dry heat because they are more resistant to dry heat than are *G. stearothermophilus* spores.
- The primary lethal process is considered to be oxidation of cell constituents.
- There are two types of dry-heat sterilizers: the static-air type and the forced-air type.
- The static-air type is referred to as the oven-type sterilizer as heating coils in the bottom of the unit cause the hot air to rise inside the chamber via gravity convection.
- This type of dry-heat sterilizer is much slower in heating, requires longer time to reach sterilizing temperature, and is less uniform in temperature control throughout the chamber than is the forced-air type.
- The forced-air or mechanical convection sterilizer is equipped with a motor-driven blower that circulates heated air throughout the chamber at a high velocity, permitting a more rapid transfer of energy from the air to the instruments

Liquid Chemicals

- Several FDA-cleared liquid chemical sterilants include indications for sterilization of medical devices
- The indicated contact times range from 3 hours to 12 hours. However, except for a few of the products, the contact time is based only on the conditions to pass the AOAC Sporicidal Test as a sterilant and not on simulated use testing with devices.
- These solutions are commonly used as high-level disinfectants when a shorter processing time is required. Generally, chemical liquid sterilants cannot be monitored using a biological indicator to verify sterility
- The survival kinetics for thermal sterilization methods, such as steam and dry heat, have been studied and characterized extensively, whereas the kinetics for sterilization with liquid sterilants are less well understood.
- The information that is available in the literature suggests that sterilization processes based on liquid chemical sterilants, in general, may not convey the same sterility assurance level as sterilization achieved using thermal or physical method.
- The data indicate that the survival curves for liquid chemical sterilants may not exhibit log-linear kinetics and the shape of the survivor curve may vary depending of the formulation, chemical nature and stability of the liquid chemical sterilant. In addition, the design of the AOAC Sporicidal Test does not provide quantification of the microbial challenge. Therefore, sterilization with a liquid chemical sterilant may not convey the same sterility assurance as other sterilization methods.
- One of the differences between thermal and liquid chemical processes for sterilization of devices is the accessibility of microorganisms to the sterilant.
- Heat can penetrate barriers, such as biofilm, tissue, and blood, to attain organism kill, whereas liquids cannot adequately penetrate these barriers.
- In addition, the viscosity of some liquid chemical sterilants impedes their access to organisms in the narrow lumens and mated surfaces of devices.
- Another limitation to sterilization of devices with liquid chemical germicides is the post-processing environment of the device. Devices cannot be wrapped or adequately contained during processing in a liquid chemical sterilant to maintain sterility following processing and

during storage. Furthermore, devices may require rinsing following exposure to the liquid chemical sterilant with water that typically is not sterile.

- Therefore, due to the inherent limitations of using liquid chemical sterilants, their use should be restricted to reprocessing critical devices that are heat-sensitive and incompatible with other sterilization methods.

Performic Acid

Performic acid is a fast-acting sporicide that was incorporated into an automated endoscope reprocessing system[400]. Systems using performic acid are not currently FDA cleared

Filtration

Although filtration is not a lethality-based process and is not an FDA-cleared sterilization method, this technology is used to remove bacteria from thermolabile pharmaceutical fluids that cannot be purified by any other means. In order to remove bacteria, the membrane pore size (e.g., 0.22 mm) must be smaller than the bacteria and uniform throughout[923]. Some investigators have appropriately questioned whether the removal of microorganisms by filtration really is a sterilization method because of slight bacterial passage through filters, viral passage through filters, and transference of the sterile filtrate into the final container under aseptic conditions entail a risk of contamination

Microwave

- Microwaves are used in medicine for disinfection of soft contact lenses, dental instruments, dentures, milk, and urinary catheters for intermittent self-catheterization.
- However, microwaves must only be used with products that are compatible (e.g., do not melt).
- Microwaves are radio-frequency waves, which are usually used at a frequency of 2450 MHz.

- The microwaves produce friction of water molecules in an alternating electrical field.
- The intermolecular friction derived from the vibrations generates heat and some authors believe that the effect of microwaves depends on the heat produced while others postulate a nonthermal lethal effect.
- The initial reports showed microwaves to be an effective microbicide.
- The microwaves produced by a “home-type” microwave oven (2.45 GHz) completely inactivate bacterial cultures, mycobacteria, viruses, and *G. stearothermophilus* spores within 60 seconds to 5 minutes depending on the challenge organism.
- Another study confirmed these results but also found that higher power microwaves in the presence of water may be needed for sterilization [2].
- Complete destruction of *Mycobacterium bovis* was obtained with 4 minutes of microwave exposure (600W, 2450 MHz).
- The effectiveness of microwave ovens for different sterilization and disinfection purposes should be tested and demonstrated as test conditions affect the results (e.g., presence of water, microwave power). Sterilization of metal instruments can be accomplished but requires certain precautions.
- Of concern is that home-type microwave ovens may not have even distribution of microwave energy over the entire dry device (there may be hot and cold spots on solid medical devices); hence there may be areas that are not sterilized or disinfected.
- The use of microwave ovens to disinfect intermittent-use catheters also has been suggested. Researchers found that test bacteria (e.g., *E. coli*, *Klebsiella pneumoniae*, *Candida albicans*) were eliminated from red rubber catheters within 5 minutes
- Microwaves used for sterilization of medical devices have not been FDA cleared.

Glass Bead “Sterilizer”

- Glass bead “sterilization” uses small glass beads (1.2-1.5 mm diameter) and high temperature (217 °C -232°C) for brief exposure times (e.g., 45 seconds) to inactivate microorganisms. These devices have been used for several years in the dental profession[0].
- FDA believes there is a risk of infection with this device because of potential failure to sterilize dental instruments and their use should be discontinued until the device has received FDA clearance.

Vaporized Hydrogen Peroxide

- Hydrogen peroxide solutions have been used as chemical sterilants for many years.
- However, the VHPâ was not developed for the sterilization of medical equipment until the mid-1980s.
- One method for delivering VHP to the reaction site uses a deep vacuum to pull liquid hydrogen peroxide (30-35% concentration) from a disposable cartridge through a heated vaporizer and then, following vaporization, into the sterilization chamber.
- A second approach to VHP delivery is the flow-through approach in which the VHP is carried into the sterilization chamber by a carrier gas such as air using either a slight negative pressure (vacuum) or slight positive pressure.
- Applications of this technology include vacuum systems for industrial sterilization of medical devices and atmospheric systems for decontaminating for large and small areas[853]. VHP offers several appealing features that include rapid cycle time (e.g., 30-45 minutes); low temperature; environmentally safe by-products (H_2O, oxygen [O_2]); good material compatibility; and ease of operation, installation and monitoring.
- VHP has limitations including that cellulose cannot be processed; nylon becomes brittle; and VHP penetration capabilities are less than those of ETO. VHP has not been cleared by FDA for sterilization of medical devices in healthcare facilities.
- The feasibility of utilizing vapor-phase hydrogen peroxide as a surface decontaminant and sterilizer was evaluated in a centrifuge decontamination application. In this study, vapor-phase hydrogen peroxide was shown to possess significant sporicidal activity.

- In preliminary studies, hydrogen peroxide vapor decontamination has been found to be a highly effective method of eradicating MRSA, *Serratia marcescens, Clostridium botulinum spores*and *Clostridium difficile* from rooms, furniture, surfaces and/or equipment; however, further investigation of this method to demonstrate both safety and effectiveness in reducing infection rates are required

Ozone

- Ozone has been used for years as a drinking water disinfectant. Ozone is produced when O_2 is energized and split into two monatomic (O_1) molecules.
- The monatomic oxygen molecules then collide with O_2 molecules to form ozone, which is O_3.
- Thus, ozone consists of O_2 with a loosely bonded third oxygen atom that is readily available to attach to, and oxidize, other molecules. This additional oxygen atom makes ozone a powerful oxidant that destroys microorganisms but is highly unstable (i.e., half-life of 22 minutes at room temperature).
- A new sterilization process, which uses ozone as the sterilant, was cleared by FDA in August 2003 for processing reusable medical devices.
- The sterilizer creates its own sterilant internally from USP grade oxygen, steam-quality water and electricity; the sterilant is converted back to oxygen and water vapor at the end of the cycle by a passing through a catalyst before being exhausted into the room.
- The duration of the sterilization cycle is about 4 h and 15 m, and it occurs at 30-35°C. Microbial efficacy has been demonstrated by achieving a SAL of $10^{-6}$with a variety of microorganisms to include the most resistant microorganism, *Geobacillus stearothermophilus*.
- The ozone process is compatible with a wide range of commonly used materials including stainless steel, titanium, anodized aluminum, ceramic, glass, silica, PVC, Teflon, silicone, polypropylene, polyethylene and acrylic. In addition, rigid lumen devices of the following diameter and length can be processed: internal diameter (ID): > 2 mm, length ≤ 25 cm; ID > 3 mm, length ≤ 47 cm; and ID > 4 mm, length ≤ 60 cm.

- The process should be safe for use by the operator because there is no handling of the sterilant, no toxic emissions, no residue to aerate, and low operating temperature means there is no danger of an accidental burn. The cycle is monitored using a self-contained biological indicator and a chemical indicator. The sterilization chamber is small, about 4 ft^3 (Written communication, S Dufresne, July 2004).
- A gaseous ozone generator was investigated for decontamination of rooms used to house patients colonized with MRSA. The results demonstrated that the device tested would be inadequate for the decontamination of a hospital room

Formaldehyde Steam

- Low-temperature steam with formaldehyde is used as a low-temperature sterilization method in many countries, particularly in Scandinavia, Germany, and the United Kingdom.
- The process involves the use of formalin, which is vaporized into a formaldehyde gas that is admitted into the sterilization chamber.
- A formaldehyde concentration of 8-16 mg/l is generated at an operating temperature of 70-75°C. The sterilization cycle consists of a series of stages that include an initial vacuum to remove air from the chamber and load, followed by steam admission to the chamber with the vacuum pump running to purge the chamber of air and to heat the load, followed by a series of pulses of formaldehyde gas, followed by steam.
- Formaldehyde is removed from the sterilizer and load by repeated alternate evacuations and flushing with steam and air.
- This system has some advantages, e.g., the cycle time for formaldehyde gas is faster than that for ETO and the cost per cycle is relatively low.
- However, ETO is more penetrating and operates at lower temperatures than do steam/formaldehyde sterilizers. Low-temperature steam formaldehyde sterilization has been found effective against vegetative bacteria, mycobacteria, *B. atrophaeus* and *G. stearothermophilus* spores and *Candida albicans*

- Formaldehyde vapor cabinets also may be used in healthcare facilities to sterilize heat-sensitive medical equipment.
- Commonly, there is no circulation of formaldehyde and no temperature and humidity controls.
- The release of gas from paraformaldehyde tablets (placed on the lower tray) is slow and produces a low partial pressure of gas. The microbicidal quality of this procedure is unknown
- Reliable sterilization using formaldehyde is achieved when performed with a high concentration of gas, at a temperature between 60^{o} and 80°C and with a relative humidity of 75 to 100%.
- Studies indicate that formaldehyde is a mutagen and a potential human carcinogen, and OSHA regulates formaldehyde.
- The permissible exposure limit for formaldehyde in work areas is 0.75 ppm measured as a 8-hour TWA. The OSHA standard includes a 2 ppm STEL (i.e., maximum exposure allowed during a 15-minute period). As with the ETO standard, the formaldehyde standard requires that the employer conduct initial monitoring to identify employees who are exposed to formaldehyde at or above the action level or STEL.
- If this exposure level is maintained, employers may discontinue exposure monitoring until there is a change that could affect exposure levels or an employee reports formaldehyde-related signs and symptoms.
- The formaldehyde steam sterilization system has not been FDA cleared for use in healthcare facilities.

Gaseous Chlorine Dioxide

- A gaseous chlorine dioxide system for sterilization of healthcare products was developed in the late 1980s.
- Chlorine dioxide is not mutagenic or carcinogenic in humans. As the chlorine dioxide concentration increases, the time required to achieve sterilization becomes progressively shorter.
- For example, only 30 minutes were required at 40 mg/l to sterilize the 10^{6} *B. atrophaeus* spores at 30^{o} to 32°C[954]. Currently, no gaseous chlorine dioxide system is FDA cleared.

Vaporized Peracetic Acid

The sporicidal activity of peracetic acid vapor at 20, 40, 60, and 80% relative humidity and 25°C was determined on *Bacillus atrophaeus* spores on paper and glass surfaces. Appreciable activity occurred within 10 minutes of exposure to 1 mg of peracetic acid per liter at 40% or higher relative humidity[955]. No vaporized peracetic acid system is FDA cleared

Infrared Radiation

- An infrared radiation prototype sterilizer was investigated and found to destroy *B. atrophaeus* spores. Some of the possible advantages of infrared technology include short cycle time, low energy consumption, no cycle residuals, and no toxicologic or environmental effects.
- This may provide an alternative technology for sterilization of selected heat-resistant instruments but there are no FDA-cleared systems for use in healthcare facilities
- The other sterilization technologies mentioned above may be used for sterilization of critical medical items if cleared by the FDA and ideally, the microbicidal effectiveness of the technology has been published in the scientific literature.
- The selection and use of disinfectants, chemical sterilants and sterilization processes in the healthcare field is dynamic, and products may become available that are not in existence when this guideline was written.
- As newer disinfectants and sterilization processes become available, persons or committees responsible for selecting disinfectants and sterilization processes should be guided by products cleared by FDA and EPA as well as information in the scientific literature

Moist heat sterilization

- A widely used method for heat sterilization is the autoclave, sometimes called a converter or steam sterilizer.

- Autoclaves use steam heated to 121–134 °C (250–273 °F) under pressure. To achieve sterility, the article is placed in a chamber and heated by injected steam until the article reaches a temperature and time setpoint.
- Almost all the air is removed from the chamber, because air is undesired in the moist heat sterilization process (this is one trait that differs from a typical pressure cooker used for food cooking).
- The article is held at the temperature setpoint for a period of time which varies depending on what bioburden is present on the article being sterilized and its resistance (D-value) to steam sterilization.
- A general cycle would be anywhere between 3 and 15 minutes, (depending on the generated heat) at 121 °C (250 °F) at 100 kPa (15 psi), which is sufficient to provide a sterility assurance level of 10^{-4} for a product with a bioburden of 10^{6} and a D-value of 2.0 minutes
- Following sterilization, liquids in a pressurized autoclave must be cooled slowly to avoid boiling over when the pressure is released. This may be achieved by gradually depressurizing the sterilization chamber and allowing liquids to evaporate under a negative pressure, while cooling the contents.
- Proper autoclave treatment will inactivate all resistant bacterial spores in addition to fungi, bacteria, and viruses, but is not expected to eliminate all prions, which vary in their resistance.
- For prion elimination, various recommendations state 121–132 °C (250–270 °F) for 60 minutes or 134 °C (273 °F) for at least 18 minutes.
- The 263K scrapie prion is inactivated relatively quickly by such sterilization procedures; however, other strains of scrapie, and strains of Creutzfeldt-Jakob disease (CKD) and bovine spongiform encephalopathy (BSE) are more resistant.
- Using mice as test animals, one experiment showed that heating BSE positive brain tissue at 134–138 °C (273–280 °F) for 18 minutes resulted in only a 2.5 log decrease in prion infectivity

Dry heat

- Dry heat was the first method of sterilization and is a longer process than moist heat sterilization.
- The destruction of microorganisms through the use of dry heat is a gradual phenomenon.
- With longer exposure to lethal temperatures, the number of killed microorganisms increases.
- Forced ventilation of hot air can be used to increase the rate at which heat is transferred to an organism and reduce the temperature and amount of time needed to achieve sterility.
- At higher temperatures, shorter exposure times are required to kill organisms.
- This can reduce heat-induced damage to food products.
- The standard setting for a hot air oven is at least two hours at 160 °C (320 °F).
- A rapid method heats air to 190 °C (374 °F) for 6 minutes for unwrapped objects and 12 minutes for wrapped objects.
- Dry heat has the advantage that it can be used on powders and other heat-stable items that are adversely affected by steam (e.g. it does not cause rusting of steel objects)

Flaming

- Flaming is done to inoculation loops and straight-wires in microbiology labs for streaking.
- Leaving the loop in the flame of a Bunsen burner or alcohol burner until it glows red ensures that any infectious agent is inactivated. This is commonly used for small metal or glass objects, but not for large objects (see Incineration below).
- However, during the initial heating, infectious material may be sprayed from the wire surface before it is killed, contaminating nearby surfaces and objects.

- Therefore, special heaters have been developed that surround the inoculating loop with a heated cage, ensuring that such sprayed material does not further contaminate the area.
- Another problem is that gas flames may leave carbon or other residues on the object if the object is not heated enough.
- A variation on flaming is to dip the object in a 70% or more concentrated solution of ethanol, then briefly touch the object to a Bunsen burner flame. The ethanol will ignite and burn off rapidly, leaving less residue than a gas flame

Incineration

- Incineration is a waste treatment process that involves the combustion of organic substances contained in waste materials.
- This method also burns any organism to ash. It is used to sterilize medical and other biohazardous waste before it is discarded with non-hazardous waste. Bacteria incinerators are mini furnaces that incinerate and kill off any microorganisms that may be on an inoculating loop or wire

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18	JAYABHAVANI.J	UAH1804195	
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SRI LAKSHMI NARAYANA INSTITUE OF HIGHER EDUCATON AND RESEARCH

Annexure III

Assessment Form

Sri Lakshmi Narayana Institute of Medical Sciences, Puducherry

MCQ

1. **……** refers to any process that removes, kills, or deactivates all forms of life
    a) Disinfection
    b) Sterilization
    c) Infection
    d) None of the above
2. Sterilization can be achieved through
    a) Heat
    b) Chemical
    c) Both a&b
    d) Only a
3. After sterilization, an object is referred to as
    a) Aseptic
    b) Infected
    c) Non sterile
    d) None of the above
4. Sterilization by ionizing radiation, primarily by
    a) Cobalt 60 Gama rays
    b) Cobalt 20 Gama rays
    c) Cobalt 30 Gama rays

d) Cobalt 40 Gama rays

5. Ionizing radiation is used to sterilization of
    a) Pharmaceuticals
    b) OT table
    c) Instruments
    d) Heart lung machine
6. Dry heat sterilizers are used to sterilization of
    a) Sharp instruments
    b) Pharmaceuticals
    c) OT table
    d) None of the above
7. One of the advantages of dry heat
    a) Toxic & harm the environment
    b) Non toxic & does not harm the environment
    c) Non toxic
    d) None of the above
8. The disadvantages for dry heat is
    a) Slow rate of heat penetration
    b) Fast rate of heat penetration
    c) Rapid rate of heat penetration
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9. Temperature for hot air sterilizers
    a) 170*c for 60 minutes
    b) 180*c for 60 minutes
    c) 120*c for 60 minutes
    d) 130*c for 60 minutes
10. Time period for liquid chemical sterilization
    a) 3 to 12 hours
    b) 4 to 12 hours
    c) 6 to 12 hours
    d) 2 to 12 hors
11. Microwaves are radio-frequency waves, which are usually used at a frequency of
    a) 2450MHz

b) 2670 MHz
c) 2756 MHz
d) 2130 MHz

12. Glass beds use temperature of
a) 217*c – 232*c
b) 321* - 345 *c
c) 117*c – 135*c
d) 312 *c – 325*c

13. Hydrogen peroxide solutions have been used as
a) Chemical
b) Radiation
c) Heat
d) Moist heat

14. Ozone has been used for years as a ……. disinfectant
a) Drinking water
b) Cold water
c) Mineral water
d) None of the above

15. …….. is used as low temperature sterilizer
a) Aldehyde
b) Formaldehyde steam
c) Ozone
d) None of the above

16. A gaseous chlorine dioxide system for sterilization of healthcare products was developed in the late
a) 1980
b) 1990
c) 2000
d) 2001

17. An infrared radiation ……. Sterilizer
a) Prototype
b) Genotype
c) Monotype

d) None of the above

18. Example for moist heat sterilization
    a) Hot air oven
    b) Autoclave
    c) Both a & b
    d) None of the above
19. Autoclave uses the temperature of
    a) 121 – 134*c
    b) 131 – 144*c
    c) 123 - 143 *c
    d) 121- 135*c
20.……. Is a waste treatment process
    a) Incineration
    b) Insemination
    c) Inclination
    d) inseration

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   d) 130*c for 60 minutes
10. Time period for liquid chemical sterilization
   a) 3 to 12 hours
   b) 4 to 12 hours
   c) 6 to 12 hours
   d) 2 to 12 hors
11. Microwaves are radio-frequency waves, which are usually used at a frequency of
   a) 2450MHz

b) 2670 MHz
c) 2756 MHz
d) 2130 MHz

12. Glass beds use temperature of
a) 217*c – 232*c
b) 321* - 345 *c
c) 117*c – 135*c
d) 312 *c – 325*c

13. Hydrogen peroxide solutions have been used as
a) Chemical
b) Radiation
c) Heat
d) Moist heat

14. Ozone has been used for years as a …… disinfectant
a) Drinking water
b) Cold water
c) Mineral water
d) None of the above

15. ……. is used as low temperature sterilizer
a) Aldehyde
b) Formaldehyde steam
c) Ozone
d) None of the above

16. A gaseous chlorine dioxide system for sterilization of healthcare products was developed in the late
a) 1980
b) 1990
c) 2000
d) 2001

17. An infrared radiation ……. Sterilizer
a) Prototype
b) Genotype
c) Monotype

d) None of the above

18. Example for moist heat sterilization
    a) Hot air oven
    b) Autoclave
    c) Both a & b
    d) None of the above

19. Autoclave uses the temperature of
    a) 121 – 134*c
    b) 121 – 144*c
    c) 121 - 143 *c
    d) 121-135*c

20..... is a waste treatment process
    a) Incineration
    b) Insemination
    c) Inclination
    d) inseration

Sri Lakshmi Narayana Institute of Medical Sciences

Affiliated to Bharath Institute of Higher Education & Research

(Deemed to be University under section 3 of the UGC Act 1956)

CERTIFICATE OF MERIT

This is to certify that_**MINNU MATHACHAN_UAH1803186**_has actively participated in the Value Added Course on **CSSD** held during month April to May 2020 Organized by Sri Lakshmi Narayana Institute of Medical Sciences, Pondicherry- 605 502, India.

Dr. G.Somasundram

COORDINATOR

RESOURCE PERSON

5Annexure- V

Student Feedback Form

Course Name: CSSD

Subject Code: VAC06/AHS/2020-16/04

Name of Student: _____Roll No.:

We are constantly looking to improve our classes and deliver the best training to you. Your evaluations, comments and suggestions will help us to improve our performance

Feedback Form

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
1. The course met my expectations.	○	○	○	○	○
2. I will be able to apply the knowledge learned.	○	○	○	○	○
3. The course objectives for each topic were identified and followed.	○	○	○	○	○
4. The content was organised and easy to follow.	○	○	○	○	○
5. The quality of instruction was good.	○	○	○	○	○
6. Class participation and interaction were encouraged.	○	○	○	○	○
7. Adequate time was provided for questions and discussion.	○	○	○	○	○

8. How do you rate the course overall?
   - ○ Excellent
   - ○ Good
   - ○ Average
   - ○ Poor
   - ○ Very poor

9. The aspects of the course could be improved?

10. Other comments?

Signature of the student:
Date:

5Annexure- V

Student Feedback Form

Course Name: CSSD

Subject Code: VAC06/AHS/2020-16/04

Name of Student: Gokul Roll No.: UAH1803184

We are constantly looking to improve our classes and deliver the best training to you. Your evaluations, comments and suggestions will help us to improve our performance

Feedback Form

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
1. The course met my expectations.	o	o	o	o	o
2. I will be able to apply the knowledge learned.	o	o	o	o	o
3. The course objectives for each topic were identified and followed.	o	o	o	o	o
4. The content was organised and easy to follow.	o	o	o	o	o
5. The quality of instruction was good.	o	o	o	o	o
6. Class participation and interaction were encouraged.	o	o	o	o	o
7. Adequate time was provided for questions and discussion.	o	o	o	o	o

8. How do you rate the course overall?
   - o Excellent
   - o Good
   - o Average
   - o Poor
   - o Very poor

9. The aspects of the course could be improved? yes

10. Other comments?

Signature of the student: Gokul

Date: 9/5/2020

5Annexure- V

Student Feedback Form

Course Name: CSSD

Subject Code: VAC06/AHS/2020-16/04

Name of Student: DONALD MORRISON Roll No.: UAH1805199

We are constantly looking to improve our classes and deliver the best training to you. Your evaluations, comments and suggestions will help us to improve our performance

Feedback Form

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
1. The course met my expectations.	o	o	o	o	o
2. I will be able to apply the knowledge learned.	o	o	o	o	o
3. The course objectives for each topic were identified and followed.	o	o	o	o	o
4. The content was organised and easy to follow.	o	o	o	o	o
5. The quality of instruction was good.	o	o	o	o	o
6. Class participation and interaction were encouraged.	o	o	o	o	o
7. Adequate time was provided for questions and discussion.	o	o	o	o	o

8. How do you rate the course overall?
   - o Excellent
   - o Good
   - o Average
   - o Poor
   - o Very poor

9. The aspects of the course could be improved? yes

10. Other comments?

Signature of the student: Donaldmorrison
Date: 9-5-2020

Date: 11.05.2020

From

Dr.G.Somasundram
Department of Pharmacology,
Sri Lakshmi Narayana Institute of Medical Sciences
Bharath Institute of Higher Education and Research,
Chennai.

Through Proper Channel

To

The Dean,
Sri Lakshmi Narayana Institute of Medical Sciences
Bharath Institute of Higher Education and Research,
Chennai.

Sub: Completion of value-added course: CSSD

Dear Sir,

With reference to the subject mentioned above, the department has conducted the value-added course titled: "**CSSD "** APRIL TO MAY 2020 for 25 AHS Students . We solicit your kind action to send certificates for the participants that is attached with this letter. Also, I am attaching the photographs captured during the conduct of the course.

Kind Regards,

Dr.G.Somasundram

Encl: Certificates :

Photographs:

Sri Lakshmi Narayana Institute of Medical Sciences

Date: 18-04-2020

From

Dr.G.SOMASUNDRAM
Principal of Allied Health Sciences,
Sri Lakshmi Narayana Institute of Medical Sciences
Bharath Institute of Higher Education and Research,
Chennai.

To

The Dean,
Sri Lakshmi Narayana Institute of Medical College
Bharath Institute of Higher Education and Research,
Chennai.

Sub: Permission to conduct value-added course: Genetic disorders

Dear Sir,

With reference to the subject mentioned above, the department proposes to conduct a value-added course titled: **genetic disorders** from May to June 2020. We solicit your kind permission for the same.

Kind Regards

Dr.G.Somasundram

FOR THE USE OF DEANS OFFICE

Names of Committee members for evaluating the course:

The Dean: **Dr. Balagurunathan. K**

The HOD: **Dr. Somasundram. G**

The Expert: **Dr. Kabilan**

The committee has discussed about the course and is approved.

Dean	Subject Expert	HOD
(Sign & Seal)	(Sign & Seal)	(Sign & Seal)

Dr. G. JAYALAKSHMI, BSC., MBBS., DTCD., M.D.,
DEAN
Sri Lakshmi Narayana Institute of Medical Sciences
Osudu, Agaram, Kudapakkam Post,
Villianur Commune, Puducherry - 605502.

PRINCIPAL
Allied Health Sciences
Sri Lakshmi Narayana Institute of Allied Health Sciences
Osudu, Agaram Post, Puducherry - 605 502.

OFFICE OF THE DEAN

Sri Lakshmi Narayana Institute of Medical Sciences

OSUDU, AGARAM VILLAGE, VILLIANUR COMMUNE, KUDAPAKKAM POST,
PUDUCHERRY - 605 502.

[Recognised by Medical Council of India, Ministry of Health letter No. U/12012/249/2005-ME (P -II) dt. 11/07/2011]
[Affliated to Bharath University, Chennai - TN]

Circular

29.04.2020

Sub: Organizing Value-added Course: "genetic disorders ".reg

With reference to the above-mentioned subject, it is to bring to your notice that Sri Lakshmi Narayana Institute of Medical Sciences, **Bharath Institute of Higher Education and Research** is organizing **"genetic disorders"**. The course content and registration form is enclosed below."

The application must reach the institution along with all the necessary documents as mentioned. The hard copy of the application should be sent to the institution by registered/ speed post only so as to reach on or before May to June 2020. Applications received after the mentioned date shall not be entertained under any circumstances.

DEAN

Encl: Copy of Course content

Dr. G. JAYALAKSHMI, BSC., MBBS., DTCD., M.D.,
DEAN
Sri Lakshmi Narayana Institute of Medical Sciences
Osudu, Agaram, Kudapakkam Post,
Villianur Commune, Puducherry - 605502.

VALUE ADDED COURSE

1. Name of the programme & Code

"Genetic disorders" & VAC07/AHS/2020-18/05

2. Duration & Period

30 hrs. & May to June 2020

3. Information Brochure and Course Content of Value-Added Courses

Enclosed as Annexure- I

4. List of students enrolled

Enclosed as Annexure- II

5. Assessment procedures:

Assessment - *Enclosed as Annexure- III*

6. Certificate model

Enclosed as Annexure- IV

7. No. of times offered during the same year:

1 time May to June 2020

8. Year of discontinuation: 2021

9. Summary report of each program year-wise

Value Added Course- May to June 2020					
Sl. No	**Course Code**	**Course Name**	**Resource Persons**	**Target Students**	**Strength & Year**
1	**VAC07/AHS/2020-18/05**	**Genetic disorders**	**DR . KABILAN**	AHS	25 students May to June 2020

10. Course Feed Back

Enclosed as Annexure- V

RESOURCE PERSON

COORDINATOR

Dr.G.Somasundram

PRINCIPAL
Allied Health Sciences
Sri Lakshmi Narayana Institute of Allied Health Sciences
Osudu, Agaram Post, Puducherry - 605 502.

Course Proposal

Course Title: "**Genetic disorder"**

Course Objective:

1. To enhance the performance skill in Genetic disorders.
2. To assess the objectives and protocols in Genetic disorder.
3. To assess the reaction of target allied Health students towards the Genetic disorder by getting their feedback.

Course Outcome: Improvement in the "Genetic disorder"
Course Audience: Students of AHS Batch 2020
Course Coordinator: Dr.G. Somasundaram
Course Faculties with Qualification and Designation:
1.Course Curriculum/Topics with schedule (Min of 30 hours)

SlNo	Date	Topic	Time	Hours
1.	18.05.2020	Introduction to Genetic disorders, Background, Objectives,	4-5p.m	1
2.	20.05.2020	Types of genetic disorders	2-3p.m	1
3.	21.05.2020	Single gene disorder	4-6p.m	2
4.	22.05.2020	Explanation about autosomal dominant and receive	4-6p.m	2
5.	25.05.2020	X linked dominant & receive	4-6p.m	2
6.	28.05.2020	Examples for the genetic disorders	4-5p.m	2
7.	30.05.2020	conventional didactic lecture and video	4-5P.M	1
8.	02.06.2020	Multifractional disorders	4-5p.m	1
9.	03.06.2020	Explanation about chromosomal disorders	4-6p.m	1
10.	04.06.2020	Common genetic disorders	4-6p.m	2
11.	05.06.2020	Causes of genetic disorders	4-6p.m	1
12.	08.06.2020	Symptoms of genetic disorders	4-6p.m	2
13.	09.06.2020	Pre course and Post Course evaluation, Feedback analysis from Likert scale	2-5p.m	3
		Practical Class I		
13.	10.06.2020	Steps model explanation and various performance assessment methods		1
14.	11.06.2020	Orientation of the students about the training program and assessment methodology by DOPS		1

15.	12.06.2017	Video demonstration of genetic disorders		2
16.	13.06.2017	Genetic disorders procedure by STEPS model		2
17.	15.06.2017	Assessment by DOPS procedure and giving feedback in weaker areas	2-6p.m	4
		Total		30 hrs

REFERENCE BOOKS:

1.GIRISH C & YATHISH K.R, Genetics Made Easy.

2.Dr. Ropali Forta, An Easy Approach to Human Genetics

3. Pranab Kr Banerjee , Problems on Genetics , Molecular Genetics and Evolutionary Genetics

GENETIC DISORDERS

- A genetic disorder is a health problem caused by one or more abnormalities in the genome.
- It can be caused by a mutation in a single gene (monogenic) or multiple genes (polygenic) or by a chromosomal abnormality.
- Although polygenic disorders are the most common, the term is mostly used when discussing disorders with a single genetic cause, either in a gene or chromosome.
- The mutation responsible can occur spontaneously before embryonic development (a *de novo* mutation), or it can be inherited from two parents who are carriers of a faulty gene (autosomal recessive inheritance) or from a parent with the disorder (autosomal dominant inheritance).
- When the genetic disorder is inherited from one or both parents, it is also classified as a **hereditary disease**.
- Some disorders are caused by a mutation on the X chromosome and have X-linked inheritance.
- Very few disorders are inherited on the Y chromosome or mitochondrial DNA
- There are well over 6,000 known genetic disorders, and new genetic disorders are constantly being described in medical literature.
- More than 600 genetic disorders are treatable.
- Around 1 in 50 people are affected by a known single-gene disorder, while around 1 in 263 are affected by a chromosomal disorder.
- Around 65% of people have some kind of health problem as a result of congenital genetic mutations.
- Due to the significantly large number of genetic disorders, approximately 1 in 21 people are affected by a genetic disorder classified as "rare" (usually defined as affecting less than 1 in 2,000 people). Most genetic disorders are rare in themselves

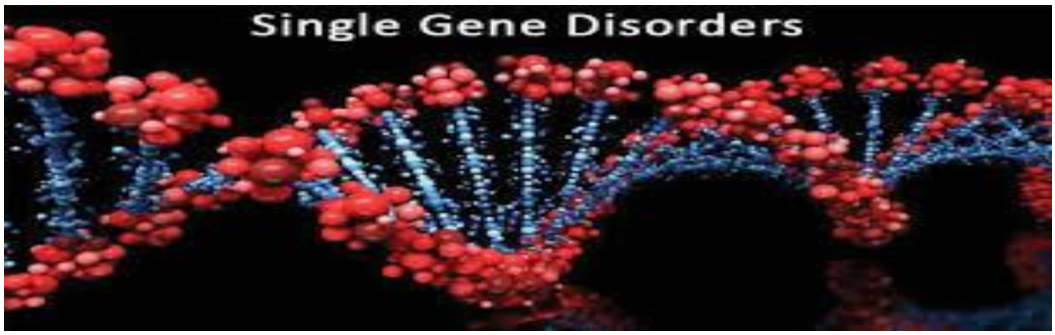
- Genetic disorders are present before birth, and some genetic disorders produce birth defects, but birth defects can also be developmental rather than hereditary.
- The opposite of a hereditary disease is an acquired disease.
- Most cancers, although they involve genetic mutations to a small proportion of cells in the body, are acquired diseases. Some cancer syndromes, however, such as *BRCA* mutations, are hereditary genetic disorders

Single-gene

- A **single-gene disorder** (or **monogenic disorder**) is the result of a single mutated gene.
- Single-gene disorders can be passed on to subsequent generations in several ways. Genomic

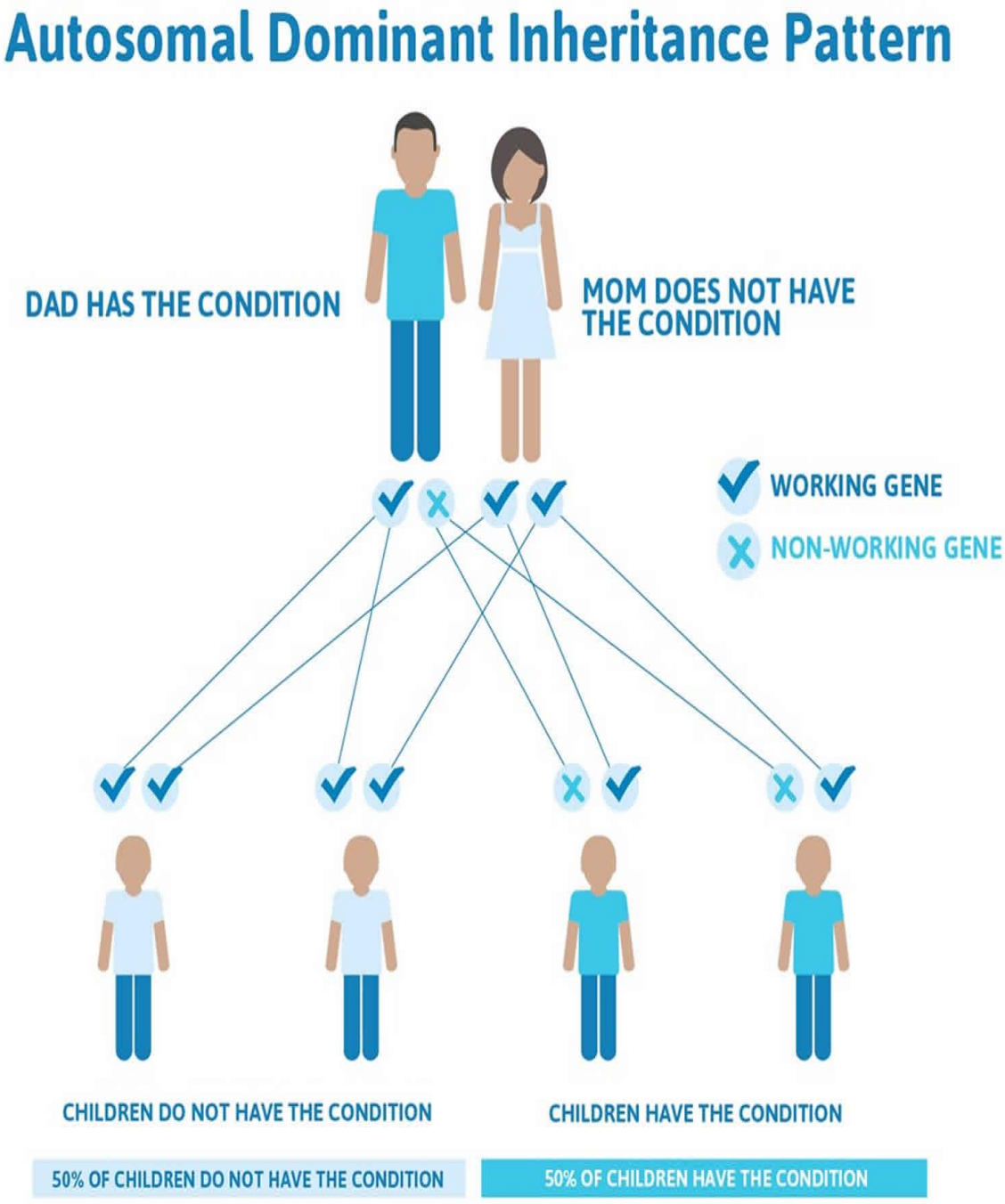
imprinting and uniparental disomy, however, may affect inheritance patterns

- . The divisions between recessive and dominant types are not "hard and fast", although the divisions between autosomal and X-linked types are (since the latter types are distinguished purely based on the chromosomal location of the gene).
- For example, the common form of dwarfism, achondroplasia, is typically considered a dominant disorder, but children with two genes for achondroplasia have a severe and usually lethal skeletal disorder, one that achondroplasics could be considered carriers for. Sickle-cell anemia is also considered a recessive condition, but heterozygous carriers have increased resistance to malaria in early childhood, which could be described as a related dominant condition. When a couple where one partner or both are sufferers or carriers of a single-gene disorder wish to have a child, they can do so through *in vitro* fertilization, which enables preimplantation genetic diagnosis to occur to check whether the embryo has the genetic disorder.
- Most congenital metabolic disorders known as inborn errors of metabolism result from single-gene defects.
- Many such single-gene defects can decrease the fitness of affected people and are therefore present in the population in lower frequencies compared to what would be expected based on simple probabilistic calculations



Autosomal dominant

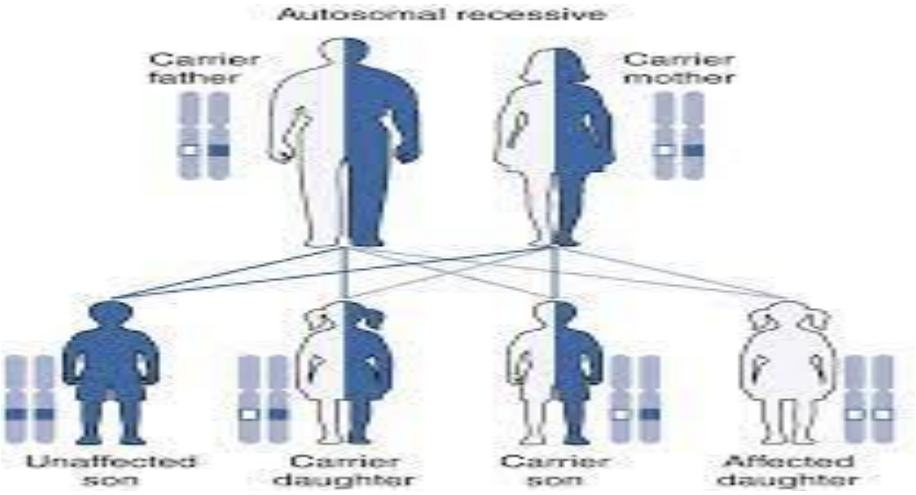
- Only one mutated copy of the gene will be necessary for a person to be affected by an autosomal dominant disorder. Each affected person usually has one affected parent.
- The chance a child will inherit the mutated gene is 50%. Autosomal dominant conditions sometimes have reduced penetrance, which means although only one mutated copy is needed, not all individuals who inherit that mutation go on to develop the disease.
- Examples of this type of disorder are Huntington's disease, neurofibromatosis type 1, neurofibromatosis type 2, Marfan syndrome, hereditary nonpolyposis colorectal cancer, hereditary multiple exostoses (a highly penetrant autosomal dominant disorder), tuberous sclerosis, Von Willebrand disease, and acute intermittent porphyria. Birth defects are also called congenital anomalies



Autosomal recessive

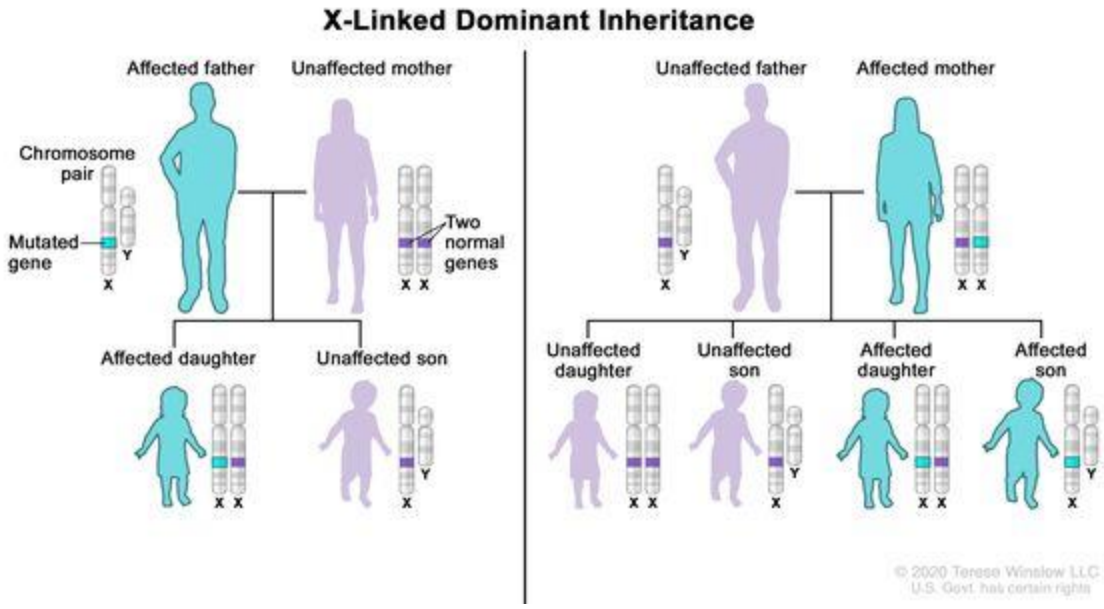
- Two copies of the gene must be mutated for a person to be affected by an autosomal recessive disorder.
- An affected person usually has unaffected parents who each carry a single copy of the mutated gene and are referred to as genetic carriers

- Each parent with a defective gene normally do not have symptoms.
- Two unaffected people who each carry one copy of the mutated gene have a 25% risk with each pregnancy of having a child affected by the disorder.
- Examples of this type of disorder are albinism, medium-chain acyl-CoA dehydrogenase deficiency, cystic fibrosis, sickle cell disease, Tay–Sachs disease, Niemann–Pick disease, spinal muscular atrophy, and Roberts syndrome.
- Certain other phenotypes, such as wet versus dry earwax, are also determined in an autosomal recessive fashion.
- Some autosomal recessive disorders are common because, in the past, carrying one of the faulty genes led to a slight protection against an infectious disease or toxin such as tuberculosis or malaria. Such disorders include cystic fibrosis,[1] sickle cell disease, phenylketonuria and thalassaemia.



X-linked dominant

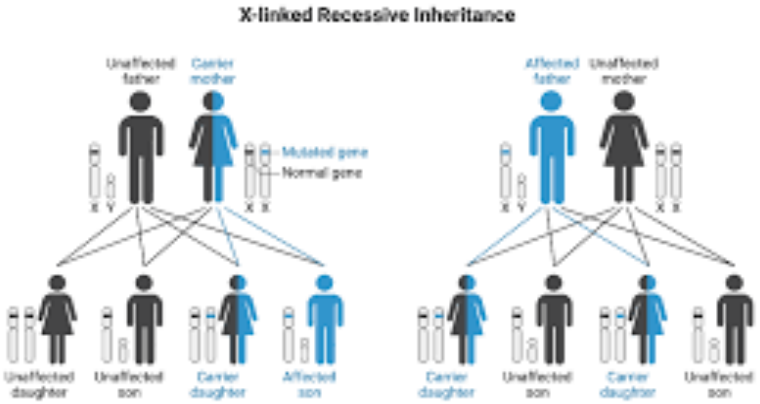
- x-linked dominant disorders are caused by mutations in genes on the X chromosome. Only a few disorders have this inheritance pattern, with a prime example being X-linked hypophosphatemic rickets.
- Males and females are both affected in these disorders, with males typically being more severely affected than females.
- Some X-linked dominant conditions, such as Rett syndrome, incontinentia pigmenti type 2, and Aicardi syndrome, are usually fatal in males either *in utero* or shortly after birth, and are therefore predominantly seen in females.
- Exceptions to this finding are extremely rare cases in which boys with Klinefelter syndrome (44+xxy) also inherit an X-linked dominant condition and exhibit symptoms more similar to those of a female in terms of disease severity
- The chance of passing on an X-linked dominant disorder differs between men and women.
- The sons of a man with an X-linked dominant disorder will all be unaffected (since they receive their father's Y chromosome), but his daughters will all inherit the condition
- A woman with an X-linked dominant disorder has a 50% chance of having an affected fetus with each pregnancy, although in cases such as incontinentia pigmenti, only female offspring are generally viable.



X-linked recessive

- X-linked recessive conditions are also caused by mutations in genes on the X chromosome. Males are much more frequently affected than females, because they only have the one X chromosome necessary for the condition to present.
- The chance of passing on the disorder differs between men and women.
- The sons of a man with an X-linked recessive disorder will not be affected (since they receive their father's Y chromosome), but his daughters will be carriers of one copy of the mutated gene.
- A woman who is a carrier of an X-linked recessive disorder (X^RX^r) has a 50% chance of having sons who are affected and a 50% chance of having daughters who are carriers of one copy of the mutated gene.

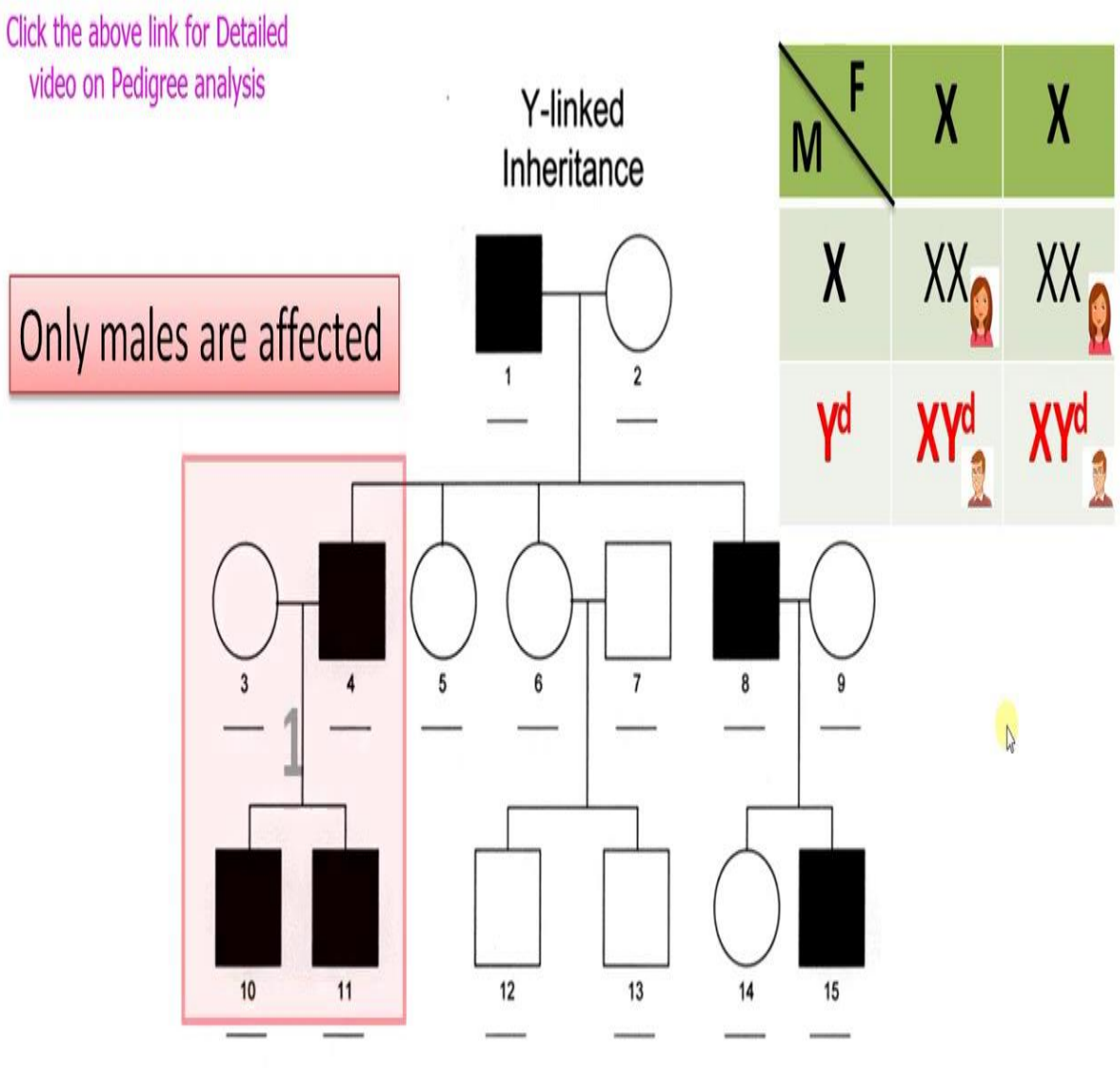
- X-linked recessive conditions include the serious diseases hemophilia A, Duchenne muscular dystrophy, and Lesch–Nyhan syndrome, as well as common and less serious conditions such as male pattern baldness and red–green color blindness.
- X-linked recessive conditions can sometimes manifest in females due to skewed X-inactivation or monosomy X (Turner syndrome).



Y-linked

- Y-linked disorders are caused by mutations on the Y chromosome. These conditions may only be transmitted from the heterogametic sex (e.g. male humans) to offspring of the same sex.
- More simply, this means that Y-linked disorders in humans can only be passed from men to their sons; females can never be affected because they do not possess Y-allosomes.
- Y-linked disorders are exceedingly rare but the most well-known examples typically cause infertility.

- Reproduction in such conditions is only possible through the circumvention of infertility by medical intervention.



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Mitochondrial

- This type of inheritance, also known as maternal inheritance, is the rarest and applies to the 13 genes encoded by mitochondrial DNA.
- Because only egg cells contribute mitochondria to the developing embryo, only mothers (who are affected) can pass on mitochondrial DNA conditions to their children. An example of this type of disorder is Leber's hereditary optic neuropathy.
- It is important to stress that the vast majority of mitochondrial diseases (particularly when symptoms develop in early life) are actually caused by a nuclear gene defect, as the mitochondria are mostly developed by non-mitochondrial DNA. These diseases most often follow autosomal recessive inheritance

Multifactorial disorder

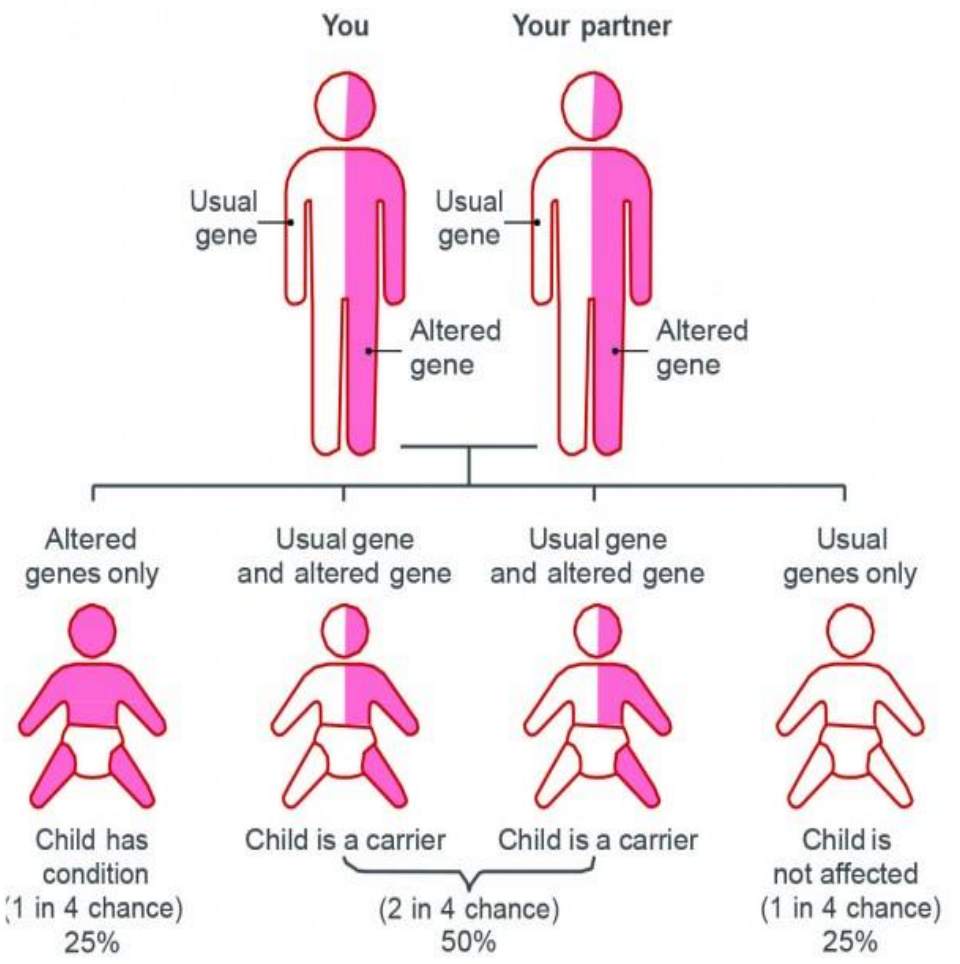
- Genetic disorders may also be complex, multifactorial, or polygenic, meaning they are likely associated with the effects of multiple genes in combination with lifestyles and environmental factors.
- Multifactorial disorders include heart disease and diabetes. Although complex disorders often cluster in families, they do not have a clear-cut pattern of inheritance.
- This makes it difficult to determine a person's risk of inheriting or passing on these disorders.
- Complex disorders are also difficult to study and treat because the specific factors that cause most of these disorders have not yet been identified. Studies that aim

to identify the cause of complex disorders can use several methodological approaches to determine genotype–phenotype associations.

- One method, the genotype-first approach, starts by identifying genetic variants within patients and then determining the associated clinical manifestations.
- This is opposed to the more traditional phenotype-first approach, and may identify causal factors that have previously been obscured by clinical heterogeneity, penetrance, and expressivity

Chromosomal disorder

- A chromosomal disorder is a missing, extra, or irregular portion of chromosomal DNA.
- It can be from an atypical number of chromosomes or a structural abnormality in one or more chromosomes. An example of these disorders is trisomy 21 (Down syndrome), in which there is an extra copy of chromosome 21.



What are common genetic disorders?

- There are many types. They include:
- **Chromosomal disorders**

- Down syndrome (Trisomy 21).
- FragileX syndrome.
- Klinefelter syndrome.
- Triple-X syndrome.
- Turner syndrome.
- Trisomy 18.

- Trisomy 13.

Multifactorial disorders

- Late-onset Alzheimer's disease.
- Arthritis.
- Autism spectrum disorder, in most cases.
- Cancer, in most cases.
- Coronary artery disease.
- Diabetes.
- Migraine headaches.
- Spina bifida.

Monogenic disorders

- Cystic fibrosis.
- Deafness that's present at birth (congenital).
- Duchenne muscular dystrophy.
- Familial hypercholesterolemia, a type of high cholesterol disease.
- Hemochromatosis (iron overload).
- Neurofibromatosis type 1 (NF1).
- Sickle cell disease.
- Tay-Sachs disease.

Are there other types of genetic disorders?

Genetic disorders may also cause rare diseases. This group of conditions affects fewer than 200,000 people in the U.S. According to experts, there may be as many as 7,000 of these diseases.

Rare genetic disorders include:

- AA amyloidosis.
- Adrenoleukodystrophy (ALD).
- Ehlers-Danlos syndrome.

- Mitochondrial diseases.
- Usher syndrome.

What are the causes of genetic disorders?

- To understand genetic disorder causes, it's helpful to learn more about how your genes and DNA work.
- Most of the DNA in your genes instructs the body to make proteins. These proteins start complex cell interactions that help you stay healthy.
- When a mutation occurs, it affects the genes' protein-making instructions. There could be missing proteins.
- Or the ones you have do not function properly. Environmental factors (also called mutagens) that could lead to a genetic mutation include:

- Chemical exposure.
- Radiation exposure.
- Smoking.
- UV exposure from the sun

What are the symptoms of genetic disorders?

Symptoms vary depending on the type of disorder, organs affected and how severe it is.

- Behavioral changes or disturbances.
- Breathing problems.
- Cognitive deficits, when the brain can't process information as it should.

- Developmental delays that include challenges with speech or social skills.
- Eating and digestive issues, such as difficulty swallowing or an inability to process nutrients.
- Limb or facial anomalies, which include missing fingers or a cleft lip and palate.
- Movement disorders due to muscle stiffness or weakness.
- Neurological issues such as seizures or stroke.
- Poor growth or short stature.
- Vision or hearing loss.

How are genetic disorders identified?

If you have a family history of a genetic disorder, you may wish to consider genetic counseling to see if genetic testing is appropriate for you.

Lab tests can typically show whether you have gene mutations responsible for that condition. In many cases, carrying the mutation does not always mean you'll end up with it.

Genetic counselors can explain your risk and if there are steps you can take to protect your health.

If there's a family history, DNA testing for genetic disorders can be an important part of starting a family. Options include:

- **Carrier testing:** This blood test shows whether you or your partner carry a mutation linked to genetic disorders. This is recommended for everyone considering pregnancy, even if there is no family history.
- **Prenatal screening:** This testing usually involves blood testing from a pregnant woman that tells a person how likely it is that an unborn child could have a common chromosome condition.

- **Prenatal diagnostic testing:** You can find out whether your unborn child faces a higher risk for certain genetic disorders. Prenatal testing uses a sample of fluid from the womb (amniocentesis).
- **Newborn screening:** This test uses a sample of your newborn baby's blood and is performed on all babies born in Ohio. Detecting genetic disorders early in life can help your child receive timely care if needed.

What is treatment for genetic disorders like?

Most genetic disorders do not have a cure. Some have treatments that may slow disease progression or lessen their impact on your life. The type of treatment that's right for you depends on the type and severity of the disease. With others, we may not have treatment but we can provide medical surveillance to try to catch complications early.

You may need:

- Medications to manage symptoms or chemotherapy to slow abnormal cell growth.
- Nutrition counseling or dietary supplements to help you get the nutrients your body needs.
- Physical, occupational or speech therapy to maximize your abilities.
- Blood transfusion to restore levels of healthy blood cells.
- Surgery to repair abnormal structures or treat complications.
- Specialized treatments, such as radiation therapy for cancer.
- Organ transplant, which is a procedure to replace a nonfunctioning organ with one from a healthy donor.

SRI LAKSHMI NARAYANA INSTITUE OF HIGHER EDUCATON AND RESEARCH

Assessment Form

Sri Lakshmi Narayana Institute of Medical Sciences, Puducherry

Multiple choice questions

1. Genetic disorder caused by abnormalities in
   a) Chromosome
   b) b) genome
   c) c) cells
   d) d) none of above
2. The mutation responsible can occur spontaneously before
   a) Embryonic development
   b) b) foetal
   c) c) growth
   d) d) birth
3. The opposite of a hereditary disease is an
   a) Acquired disease
   b) b) mutation
   c) c) inherited
   d) d) by birth
4. A single-gene disorder is the result of
   a) single muted gene
   b) double muted
   c) triple gene
   d) four gene
5. single gene disorder also called as
   a) monogenic disorder
   b) myogenic disorder
   c) cytogenic disorder
   d) minogenic disorder

6. Example for single genome disorder
    a) dwarfism
    b) marfan syndrome
    c) Willebrand disease
    d) TB
7. Example for autosomal dominant disorder
    a) Huntington's disease
    b) dwarfism
    c) typhoid
    d) sickle cell anemia
8. An effected person usually has unaffected parents who each carry a single copy of the mutated gene and are referred to as
    a) Genetic carriers
    b) mutation carriers
    c) chromosome carriers
    d) cells carriers
9. Example for Autosomal recessive
    a) Albinism
    b) Rett syndrome
    c) porphyria
    d) dwarfism
10. X-linked dominant disorders are caused by mutations in genes on the
    a) x chromosome
    b) y chromosome
    c) mutation
    d) genome
11. Example for x linked dominant
    a. Klinefelter syndrome
    b. Roberts syndrome
    c. colorectal cancer
    d. malaria
12. Y-linked disorders are caused by mutations on the
    a. Y chromosome
    b. gene
    c. X chromosome

d. mutation

13. mitochondrial inheritance also called as

a) maternal inheritance

b) eternal

c) paternal

d) genome

14. Example for mitochondrial inheritance

a) lebers hereditary optic neuropathy

b) hemophilia A

c) color blindness

d) turner syndrome

15. chromosomal disorder is missing of

a) chromosome

b) gene

c) mutation

d) genome

16. Example for trisomy 21

a) down syndrome

b) hemophilia

c) arthritis

d) Alzheimer disease

17. identify any multifractional disease

a) spina difidia

b) fragile x syndrome

c) triple x syndrome

d) cystic fibrosis

18. identify the non-environmental factor that leads to genetic disorder

a) chemical exposure

b) radiation exposure

c) genetics

d) smoking

19. Test used to diagnosis genetic disorder

a) Prenatal screening

b) Newborn screening

c) both a & b

d) none of the above

20. which of the following not a rare genetic disorder

a) AA amyloidosis

b)Adrenoleukodystrophy (ALD)

c)Ehlers-Danlos syndrome

d) AIDS

SRI LAKSHMI NARAYANA INSTITUE OF HIGHER EDUCATON AND RESEARCH

Assessment Form

ANNEXURE - III

Sri Lakshmi Narayana Institute of Medical Sciences, Puducherry

COURSE CODE :- VAC07/AHS/2020-18/05

Multiple choice questions

1. Genetic disorder caused by abnormalities in
   a) Chromosome
   b) b) genome
   c) c) cells
   d) d) none of above
2. The mutation responsible can occur spontaneously before
   a) Embryonic development
   b) b) foetal
   c) c) growth
   d) d) birth
3. The opposite of a hereditary disease is an
   a) Acquired disease
   b) b) mutation
   c) c) inherited
   d) d) by birth
4. A single-gene disorder is the result of
   a) single muted gene
   b) double muted
   c) triple gene
   d) four gene
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   a) monogenic disorder
   b) myogenic disorder
   c) cytogenic disorder
   d) minogenic disorder

6. Example for single genome disorder
   a) dwarfism
   b) marfan syndrome
   c) Willebrand disease
   d) TB
7. Example for autosomal dominant disorder
   a) Huntington's disease
   b) dwarfism
   c) typhoid
   d) sickle cell anemia
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   b) y chromosome
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   d) genome
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   b. Roberts syndrome
   c. colorectal cancer
   d. malaria
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   a. Y chromosome
   b. gene
   c. X chromosome

d. mutation

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a) maternal inheritance

b) eternal

c) paternal

d) genome

14. Example for mitochondrial inheritance

a) lebers hereditary optic neuropathy

b) hemophilia A

c) color blindness

d) turner syndrome

15. chromosomal disorder is missing of

a) chromosome

b) gene

c) mutation

d) genome

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a) down syndrome

b) hemophilia

c) arthritis

d) Alzheimer disease

17. identify any multifractional disease

a) spina difidia

b) fragile x syndrome

c) triple x syndrome

d) cystic fibrosis

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a) chemical exposure

b) radiation exposure

c) genetics

d) smoking

19. Test used to diagnosis genetic disorder

a) Prenatal screening

b) Newborn screening

c) both a & b

d) none of the above

20. which of the following not a rare genetic disorder

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b)Adrenoleukodystrophy (ALD)

c)Ehlers-Danlos syndrome

d) AIDS

GD

SRI LAKSHMI NARAYANA INSTITUE OF HIGHER EDUCATON AND RESEARCH

Assessment Form ANNEXURE - IV

Sri Lakshmi Narayana Institute of Medical Sciences, Puducherry

COURSE CODE - VAC07/AHS/2020-18/05

Multiple choice questions

1. Genetic disorder caused by abnormalities in
   a) Chromosome
   b) b) genome
   c) c) cells
   d) d) none of above
2. The mutation responsible can occur spontaneously before
   a) Embryonic development
   b) b) foetal
   c) c) growth
   d) d) birth
3. The opposite of a hereditary disease is an
   a) Acquired disease
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    a) x chromosome
    b) y chromosome
    c) mutation
    d) genome
11. Example for x linked dominant
    a. Klinefelter syndrome
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    c. colorectal cancer
    d. malaria
12. Y-linked disorders are caused by mutations on the
    a. Y chromosome
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d) genome

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20. which of the following not a rare genetic disorder

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c)Ehlers-Danlos syndrome

d) AIDS

Sri Lakshmi Narayana Institute of Medical Sciences

Affiliated to Bharath Institute of Higher Education & Research

(Deemed to be University under section 3 of the UGC Act 1956)

CERTIFICATE OF MERIT

This is to certify that **GOKUL A UAH1803184** has actively participated in the Value Added Course on **Genetic disorder VAC07/AHS/2020-18/05** held during May to June 2020 Organized by Sri Lakshmi Narayana Institute of Medical Sciences, Pondicherry- 605 502, India.

Dr. G.Somasundram

COORDINATOR

RESOURCE PERSON

5Annexure- V

Student Feedback Form

Course Name : GENITIC DISORDER

Subject Code: VAC07/AHS/2020-18/05

Name of Student: _____Roll No.:

We are constantly looking to improve our classes and deliver the best training to you. Your evaluations, comments and suggestions will help us to improve our performance

Feedback Form

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
1. The course met my expectations.	○	○	○	○	○
2. I will be able to apply the knowledge learned.	○	○	○	○	○
3. The course objectives for each topic were identified and followed.	○	○	○	○	○
4. The content was organised and easy to follow.	○	○	○	○	○
5. The quality of instruction was good.	○	○	○	○	○
6. Class participation and interaction were encouraged.	○	○	○	○	○
7. Adequate time was provided for questions and discussion.	○	○	○	○	○

8. How do you rate the course overall?
   - ○ Excellent
   - ○ Good
   - ○ Average
   - ○ Poor
   - ○ Very poor

9. The aspects of the course could be improved?

10. Other comments?

Signature of the student:
Date:

Student Feedback Form

Course Name : GENITIC DISORDER

Subject Code: VAC07/AHS/2020-18/05

Name of Student: DONALD MORRIS Roll No.: UAH1805199

We are constantly looking to improve our classes and deliver the best training to you. Your evaluations, comments and suggestions will help us to improve our performance

Feedback Form

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
1. The course met my expectations.	o	✓	o	o	o
2. I will be able to apply the knowledge learned.	✓	o	o	o	o
3. The course objectives for each topic were identified and followed.	o	✓	o	o	o
4. The content was organised and easy to follow.	✓	o	o	o	o
5. The quality of instruction was good.	o	✓	o	o	o
6. Class participation and interaction were encouraged.	✓	o	o	o	o
7. Adequate time was provided for questions and discussion.	o	✓	o	o	o

8. How do you rate the course overall?
   - o Excellent
   - ✓ Good
   - o Average
   - o Poor
   - o Very poor

9. The aspects of the course could be improved? practical classes should be improved

10. Other comments? → our staff very good at teaching

Signature of the student: Donald Morris
Date: 15/06/17

Student Feedback Form

Course Name : GENITIC DISORDER

Subject Code: VAC07/AHS/2020-18/05

Name of Student: ASHIK . P Roll No.: UAH1803182

We are constantly looking to improve our classes and deliver the best training to you. Your evaluations, comments and suggestions will help us to improve our performance

Feedback Form

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
1. The course met my expectations.	✓	o	o	o	o
2. I will be able to apply the knowledge learned.	o	✓	o	o	o
3. The course objectives for each topic were identified and followed.	o	✓	o	o	o
4. The content was organised and easy to follow.	o	o	o	o	o
5. The quality of instruction was good.	o	✓	o	o	o
6. Class participation and interaction were encouraged.	o	o	o	o	o
7. Adequate time was provided for questions and discussion.	o	✓	o	o	o

8. How do you rate the course overall?
   - o Excellent
   - ✓ Good
   - o Average
   - o Poor
   - o Very poor

9. The aspects of the course could be improved? Improved practical classes only.

10. Other comments? Very good at teaching.

Signature of the student: Ashik
Date: 15/06/17

Date: 14.06.2020

From

Dr.G.Somasundram
Department of Pharmacology,
Sri Lakshmi Narayana Institute of Medical Sciences
Bharath Institute of Higher Education and Research,
Chennai.

Through Proper Channel

To

The Dean,
Sri Lakshmi Narayana Institute of Medical Sciences
Bharath Institute of Higher Education and Research,
Chennai.

Sub: Completion of value-added course: GENITIC DISORDER for AHS

Dear Sir,

With reference to the subject mentioned above, the department has conducted the value-added course titled: " **GENITIC DISORDER"** May to June 2020 for 25 AHS Students . We solicit your kind action to send certificates for the participants that is attached with this letter. Also, I am attaching the photographs captured during the conduct of the course.

Kind Regards,

Dr.G.Somasundram

Encl: Certificates :

Photographs:


vivo X70 Pro · ZEISS · ClassyTamil

SRI LAKSHMI NARAYANA INSTITUTE OF ALLIED HEALTH SCIENCE

MEDICAL EDUCATIONAL PROJECT

GENITIC DISORDER - VAC07/AHS/2020-18/05

S.No.	Name of the Students	University Register Number	Signature
1	AKSHAY SURESH	UAH1803178	
2	ANAGHA SUKUMARAN	UAH1803179	
3	APARNA REMESHAN	UAH1803180	
4	ASHIK.R	UAH1803182	
5	FEBA SUSAN ABRAHAM	UAH1803183	
6	GOKUL A	UAH1803184	
7	JIJI ELZA JOSE	UAH1803185	
8	MINNU MATHACHAN	UAH1803186	
9	MUHAMMED IRFAN.I	UAH1803187	
10	MURALIKRISHNAN.K	UAH1803188	
11	DONALD MORISON.S	UAH1805199	
12	GADDALA PRAVEEN	UAH1805200	
13	PRAVEEN.G	UAH1805201	
14	RAMANAN.V	UAH1805202	
15	SARATH P S	UAH1805203	
16	S.K.DHARSHINI	UAH1804193	
17	GAYATHRI.V	UAH1804194	
18	JAYABHAVANI.J	UAH1804195	
19	MALATHI.S	UAH1804196	
20	NARAYANADASS.M	UAH1804197	
21	SANDRA.S	UAH1803190	
22	SATHISHKUMAR.R	UAH1803191	
23	SHEHANAYI.M	UAH1803192	
24	VENKATESH.S	UAH1805204	
25	YAZHINI.P	UAH1805205	

SRI LAKSHMI NARAYANA INSTITUTE OF ALLIED HEALTH SCIENCE

MEDICAL EDUCATIONAL PROJECT

GENITIC DISORDER - VAC07/AHS/2020-18/05

S.No.	Name of the Students	University Register Number	Signature
1	AKSHAY SURESH	UAH1803178	
2	ANAGHA SUKUMARAN	UAH1803179	
3	APARNA REMESHAN	UAH1803180	
4	ASHIK.R	UAH1803182	
5	FEBA SUSAN ABRAHAM	UAH1803183	
6	GOKUL A	UAH1803184	
7	JIJI ELZA JOSE	UAH1803185	
8	MINNU MATHACHAN	UAH1803186	
9	MUHAMMED IRFAN.I	UAH1803187	
10	MURALIKRISHNAN.K	UAH1803188	
11	DONALD MORISON.S	UAH1805199	
12	GADDALA PRAVEEN	UAH1805200	
13	PRAVEEN.G	UAH1805201	
14	RAMANAN.V	UAH1805202	
15	SARATH P S	UAH1805203	
16	S.K.DHARSHINI	UAH1804193	
17	GAYATHRI.V	UAH1804194	
18	JAYABHAVANI.J	UAH1804195	
19	MALATHI.S	UAH1804196	
20	NARAYANADASS.M	UAH1804197	
21	SANDRA.S	UAH1803190	
22	SATHISHKUMAR.R	UAH1803191	
23	SHEHANAYI.M	UAH1803192	
24	VENKATESH.S	UAH1805204	
25	YAZHINI.P	UAH1805205	

Sri Lakshmi Narayana Institute of Medical Sciences

Date: 15-05-2020

From

Dr.G.SOMASUNDRAM
Principal of Allied Health Sciences,
Sri Lakshmi Narayana Institute of Medical Sciences
Bharath Institute of Higher Education and Research,
Chennai.

To

The Dean,
Sri Lakshmi Narayana Institute of Medical College
Bharath Institute of Higher Education and Research,
Chennai.

Sub: Permission to conduct value-added course: Disinfection

Dear Sir,

With reference to the subject mentioned above, the department proposes to conduct a value-added course titled: **Disinfection** from June to July 2020 . We solicit your kind permission for the same.

Kind Regards

Dr.G.Somasundram

FOR THE USE OF DEANS OFFICE

Names of Committee members for evaluating the course:

The Dean: **Dr. Balagurunathan. K**

The HOD: **Dr. Somasundram. G**

The Expert: **Dr.**

The committee has discussed about the course and is approved.

Dean	Subject Expert	HOD
(Sign & Seal)	(Sign & seal)	(Sign & Seal)

Dr. G. JAYALAKSHMI, BSC., MBBS., DTCD., M.D.,
DEAN
Sri Lakshmi Narayana Institute of Medical Sciences
Osudu, Agaram, Kudapakkam Post,
Villianur Commune, Puducherry - 605502.

PRINCIPAL
Allied Health Sciences
Sri Lakshmi Narayana Institute of Allied Health Sciences
Osudu, Agaram Post, Puducherry - 605 502.

OFFICE OF THE DEAN

Sri Lakshmi Narayana Institute of Medical Sciences

OSUDU, AGARAM VILLAGE, VILLIANUR COMMUNE, KUDAPAKKAM POST,
PUDUCHERRY - 605 502.
[Recognised by Medical Council of India, Ministry of Health letter No. U/12012/249/2005-ME (P -II) dt. 11/07/2011]
[Affliated to Bharath University, Chennai - TN]

Circular

31.05.2020

Sub: Organizing Value-added Course: "Disinfection ".reg

With reference to the above-mentioned subject, it is to bring to your notice that Sri Lakshmi Narayana Institute of Medical Sciences, **Bharath Institute of Higher Education and Research** is organizing **"Disinfection"**. The course content and registration form is enclosed below."

The application must reach the institution along with all the necessary documents as mentioned. The hard copy of the application should be sent to the institution by registered/ speed post only so as to reach on or before June to July 2020 . Applications received after the mentioned date shall not be entertained under any circumstances.

Dean

Dr. G. JAYALAKSHMI, BSC., MBBS., DTCD., M.D.,
DEAN
Sri Lakshmi Narayana Institute of Medical Sciences
Osudu, Agaram, Kudapakkam Post,
Villianur Commune, Puducherry - 605502.

Encl: Copy of Course content

VALUE ADDED COURSE

1. Name of the programme & Code

"Disinfection" & VAC08/AHS/2020-15/06

2. Duration & Period

30 hrs. & June to July 2020

3. Information Brochure and Course Content of Value Added Courses

Enclosed as Annexure- I

4. List of students enrolled

Enclosed as Annexure- II

5. Assessment procedures:

Assessment - *Enclosed as Annexure- III*

6. Certificate model

Enclosed as Annexure- IV

7. No. of times offered during the same year:

1 time June to July 2020

8. Year of discontinuation: 2021

9. Summary report of each program year-wise

Value Added Course- July to August 2017					
Sl. No	**Course Code**	**Course Name**	**Resource Persons**	**Target Students**	**Strength & Year**
1	**VAC08/AHS/2020-15/06**	Disinfection	**DR. JAIKUMAR**	AHS	27 students June to July 2020

10. Course Feed Back

Enclosed as Annexure- V

RESOURCE PERSON

COORDINATOR

DR.G.SOMASUNDARAM

PRINCIPAL
Allied Health Sciences
Sri Lakshmi Narayana Institute of Allied Health Sciences
Osudu, Agaram Post, Puducherry - 605 502.

Course Proposal

Course Title: "**Disinfection"**

Course Objective:

1. To enhance the performance in Disinfection.
2. To assess the objectives and protocols in Disinfection.
3. To assess the reaction of target allied Health students towards the Disinfection by getting their feedback.

Course Outcome: Improvement in the "Disinfection"
Course Audience: Students of AHS Batch 2020
Course Coordinator: Dr.G.Somasundram
Course Faculties with Qualification and Designation:
1.Course Curriculum/Topics with schedule (Min of 30 hours)

SlNo	Date	Topic	Time	Hours
1.	15.06.2020	Introduction to disinfectants, Background, Objectives,	4-5p.m	1
2.	17.06.2020	Low level& high-level disinfectant	2-3p.m	1
3.	19.06.2020	Properties of disinfectant	4-6p.m	2
4.	20.06.2020	Types of disinfectant	4-6p.m	2
5.	22.06.2020	Alcohol	4-6p.m	2
6.	24.06.2020	Aldehyde	4-5p.m	2
7.	26.06.2020	conventional didactic lecture and video	4-5P.M	1
8.	29.06.2020	Quaternary amino compounds	4-5p.m	1
9.	30.06.2020	Inorganic compounds	4-6p.m	1
10.	1.07.2020	Non chemical method	4-6p.m	2
11.	3.07.2020	Home disinfectants	4-6p.m	1
12.	6.07.2020	Metals	4-6p.m	2
13.	9.07.2020	Pre course and Post Course evaluation, Feedback analysis from Likert scale	2-5p.m	3
		Practical Class I		
13.	10.07.2020	Steps model explanation and various performance assessment methods		1
14.	13.07.2020	Orientation of the students about the training program and assessment methodology by DOPS		1
15.	15.07.2020	Video demonstration of disinfectants		2

16.	17.07.2020	Disinfectants procedure by STEPS model		2
17.	18.07.2020	Assessment by DOPS procedure and giving feedback in weaker areas	2-6p.m	4
		Total		30 hrs

REFERENCE BOOKS:

1.Shakti Kumar Gupta & Sunil Kant, A Hand Book on Housekeeping and Disinfection Practices for Heal care Facilities

2. Steve E Hrudey & Jeffrey WA Charrols, Disinfection by Products & Human Health

3. Joseph M. Ascenzi , Hand Book of Disinfectants and Antiseptics

DISINFECTANTS

- A **disinfectant** is a chemical substance or compound used to inactivate or destroy microorganisms on inert surfaces.
- Disinfection does not necessarily kill all microorganisms, especially resistant bacterial spores; it is less effective than sterilization, which is an extreme physical or chemical process that kills all types of life.
- Disinfectants are generally distinguished from other antimicrobial agents such as antibiotics, which destroy microorganisms within the body, and antiseptics, which destroy microorganisms on living tissue. Disinfectants are also different from biocides—the latter are intended to destroy all forms of life, not just microorganisms.
- Disinfectants work by destroying the cell wall of microbes or interfering with their metabolism.
- It is also a form of decontamination, and can be defined as the process whereby physical or chemical methods are used to reduce the amount of pathogenic microorganisms on a surface.
- Disinfectants can also be used to destroy microorganisms on the skin and mucous membrane, as in the medical dictionary historically the word simply meant that it destroys microbes.
- Sanitizers are substances that simultaneously clean and disinfect.
- Disinfectants kill more germs than sanitizers. Disinfectants are frequently used in hospitals, dental surgeries, kitchens, and bathrooms to kill infectious organisms.
- Sanitizers are mild compared to disinfectants and are used majorly to clean things that are in human contact whereas disinfectants are concentrated and are used to clean surfaces like floors and building premises
- Bacterial endospores are most resistant to disinfectants, but some fungi, viruses and bacteria also possess some resistance.

Definitions

The Australian Therapeutic Goods Order No. 54 defines several grades of disinfectant as will be used below.

Sterilant

Sterilant means a chemical agent which is used to sterilize critical medical devices or medical instruments. A sterilant kills all micro-organisms with the result that the sterility assurance level of a microbial survivor is less than 10^-6. Sterilant gases are not within this scope.

Low level disinfectant

Low level disinfectant means a disinfectant that rapidly kills most vegetative bacteria as well as medium sized lipid containing viruses, when used according to labelling. It cannot be relied upon to destroy, within a practical period, bacterial endospores, mycobacteria, fungi, or all small nonlipid viruses

.

Intermediate level disinfectant

Intermediate level disinfectant means a disinfectant that kills all microbial pathogens except bacterial endospores, when used as recommended by the manufacturer. It is bactericidal, tuberculocidal, fungicidal (against asexual spores but not necessarily dried chlamydospores or sexual spores), and virucidal.

High level disinfectant

High level disinfectant means a disinfectant that kills all microbial pathogens, except large numbers of bacterial endospores when used as recommended by its manufacturer

.

Instrument grade

Instrument grade disinfectant means:

1. a disinfectant which is used to reprocess reusable therapeutic devices; and
2. when associated with the words “low”, “intermediate” or “high” means “low”, “intermediate” or “high” level disinfectant respectively.

Hospital grade

Hospital grade disinfectant means a disinfectant that is suitable for general purpose disinfection of building and fitting surfaces, and purposes not involving instruments or surfaces likely to come into contact with broken skin:

1. in premises used for:
    -
        - the investigation or treatment of a disease, ailment or injury; or
        - procedures that are carried out involving the penetration of the

human skin; or,

1. in connection with:
    -
        - the business of beauty therapy or hairdressing; or
        - the practice of podiatry;

but does not include :

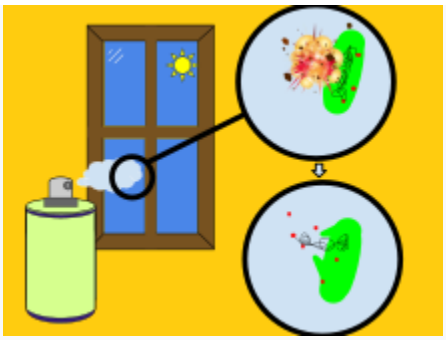
1. **Instrument grade disinfectants**; or
2. **sterilant**; or
3. an antibacterial clothes preparation; or
4. a sanitary fluid; or

5. a sanitary powder; or
6. a sanitizer

Household/commercial grade

Household/commercial grade disinfectant means a disinfectant that is suitable for general purpose disinfection of building or fitting surfaces, and for other purposes, in premises or involving procedures other than those specified for a hospital-grade disinfectant, but is not:

1. an antibacterial clothes preparation; or
2. a sanitary fluid; or
3. a sanitary powder; or
4. a sanitizer



Properties

- A perfect disinfectant would also offer complete and full microbiological sterilization, without harming humans and useful form of life, be inexpensive, and noncorrosive.
- However, most disinfectants are also, by nature, potentially harmful (even toxic) to humans or animals.
- Most modern household disinfectants contain denatonium, an exceptionally bitter substance added to discourage ingestion, as a safety measure.

- Those that are used indoors should never be mixed with other cleaning products as chemical reactions can occur. The choice of disinfectant to be used depends on the particular situation.
- Some disinfectants have a wide spectrum (kill many different types of microorganisms), while others kill a smaller range of disease-causing organisms but are preferred for other properties (they may be non-corrosive, non-toxic, or inexpensive).
- There are arguments for creating or maintaining conditions that are not conducive to bacterial survival and multiplication, rather than attempting to kill them with chemicals.
- Bacteria can increase in number very quickly, which enables them to evolve rapidly.
- Should some bacteria survive a chemical attack, they give rise to new generations composed completely of bacteria that have resistance to the particular chemical used.
- Under a sustained chemical attack, the surviving bacteria in successive generations are increasingly resistant to the chemical used, and ultimately the chemical is rendered ineffective.
- For this reason, some question the wisdom of impregnating cloths, cutting boards and worktops in the home with bactericidal chemicals

Types

Air disinfectants

- Air disinfectants are typically chemical substances capable of disinfecting microorganisms suspended in the air.
- Disinfectants are generally assumed to be limited to use on surfaces, but that is not the case.
- In 1928, a study found that airborne microorganisms could be killed using mists of dilute bleach.
- An air disinfectant must be dispersed either as an aerosol or vapour at a sufficient concentration in the air to cause the number of viable infectious microorganisms to be significantly reduced.

- In the 1940s and early 1950s, further studies showed inactivation of diverse bacteria, influenza virus, and *Penicillium chrysogenum* (previously *P. notatum*) mold fungus using various glycols, principally propylene glycol and triethylene glycol.
- In principle, these chemical substances are ideal air disinfectants because they have both high lethality to microorganisms and low mammalian toxicity.
- Although glycols are effective air disinfectants in controlled laboratory environments, it is more difficult to use them effectively in real-world environments because the disinfection of air is sensitive to continuous action.
- Continuous action in real-world environments with outside air exchanges at door, HVAC, and window interfaces, and in the presence of materials that adsorb and remove glycols from the air, poses engineering challenges that are not critical for surface disinfection.
- The engineering challenge associated with creating a sufficient concentration of the glycol vapours in the air have not to date been sufficiently addressed

Alcohols

- Automatic hand sanitizer in Tomaszów Mazowiecki, Poland
- *: Hand sanitizer*
- Alcohol[and alcohol plus Quaternary ammonium cation based compounds comprise a class of proven surface sanitizers and disinfectants approved by the EPA and the Centers for Disease Control for use as a hospital grade disinfectant.
- Alcohols are most effective when combined with distilled water to facilitate diffusion through the cell membrane; 100% alcohol typically denatures only external membrane proteins.
- A mixture of 70% ethanol or isopropanol diluted in water is effective against a wide spectrum of bacteria, though higher concentrations are often needed to disinfect wet surfaces.
- Additionally, high-concentration mixtures (such as 80% ethanol + 5% isopropanol) are required to effectively inactivate lipid-enveloped viruses (such as HIV, hepatitis B, and hepatitis C).[26][27][28][29]

- The efficacy of alcohol is enhanced when in solution with the wetting agent dodecanoic acid (coconut soap).
- The synergistic effect of 29.4% ethanol with dodecanoic acid is effective against a broad spectrum of bacteria, fungi, and viruses. Further testing is being performed against Clostridium difficile (C.Diff) spores with higher concentrations of ethanol and dodecanoic acid, which proved effective with a contact time of ten minutes.

Aldehydes

- Aldehydes, such as formaldehyde and glutaraldehyde, have a wide microbicidal activity and are sporicidal and fungicidal.
- They are partly inactivated by organic matter and have slight residual activity.
- Some bacteria have developed resistance to glutaraldehyde, and it has been found that glutaraldehyde can cause asthma and other health hazards, hence ortho-phthalaldehyde is replacing glutaraldehyde

Peroxy and peroxo acids

Peroxycarboxylic acids and inorganic peroxo acids are strong oxidants and extremely effective disinfectants.

- Peroxyformic acid
- Peracetic acid
- Peroxypropionic acid
- Monoperoxyglutaric acid
- Monoperoxysuccinic acid

- Peroxybenzoic acid
- Peroxyanisic acid
- Chloroperbenzoic acid
- Monoperoxyphthalic acid

Phenolics

Phenolics are active ingredients in some household disinfectants. They are also found in some mouthwashes and in disinfectant soap and handwashes. Phenols are toxic to cats[1] and newborn humans

- Phenol is probably the oldest known disinfectant as it was first used by Lister, when it was called carbolic acid. It is rather corrosive to the skin and sometimes toxic to sensitive people. Impure preparations of phenol were originally made from coal tar, and these contained low concentrations of other aromatic hydrocarbons including benzene, which is an IARC Group 1 carcinogen.
- *o*-Phenylphenol is often used instead of phenol, since it is somewhat less corrosive.
- Chloroxylenol is the principal ingredient in Dettol, a household disinfectant and antiseptic.
- Hexachlorophene is a phenolic that was once used as a germicidal additive to some household products but was banned due to suspected harmful effects.
- Thymol, derived from the herb thyme, is the active ingredient in some "broad spectrum" disinfectants that often bear ecological claims. It is used as a stabilizer in pharmaceutic preparations. It has been used for its antiseptic, antibacterial, and antifungal actions, and was formerly used as a vermifuge.
- Amylmetacresol is found in Strepsils, a throat disinfectant.
- Although not a phenol, 2,4-dichlorobenzyl alcohol has similar effects as phenols, but it cannot inactivate viruses.

Quaternary ammonium compounds

- Quaternary ammonium compounds ("quats"), such as benzalkonium chloride, are a large group of related compounds.
- Some concentrated formulations have been shown to be effective low-level disinfectants.
- Quaternary ammonia at or above 200ppm plus alcohol solutions exhibit efficacy against difficult to kill non-enveloped viruses such as norovirus, rotavirus, or polio virus.
- Newer synergous, low-alcohol formulations are highly effective broad-spectrum disinfectants with quick contact times (3–5 minutes) against bacteria, enveloped viruses, pathogenic fungi, and mycobacteria.
- Quats are biocides that also kill algae and are used as an additive in large-scale industrial water systems to minimize undesired biological growth.

Inorganic compounds

Chlorine

This group comprises aqueous solution of chlorine, hypochlorite, or hypochlorous acid. Occasionally, chlorine-releasing compounds and their salts are included in this group. Frequently, a concentration of < 1 ppm of available chlorine is sufficient to kill bacteria and viruses, spores and mycobacteria requiring higher concentrations. Chlorine has been used for applications, such as the deactivation of pathogens in drinking water, swimming pool water and wastewater, for the disinfection of household areas and for textile bleaching

- Sodium hypochlorite
- Calcium hypochlorite
- Monochloramine
- Chloramine-T
- Trichloroisocyanuric acid
- Chlorine dioxide
- Hypochlorous acid

Iodine

- Iodine

- Iodophors

Acids and bases

- Sodium hydroxide
- Potassium hydroxide
- Calcium hydroxide
- Magnesium hydroxide
- Sulfurous acid
- Sulfur dioxide
- phosphoric acid
- dodecylbenzenesulfonic acid

Metals

Most metals, especially those with high atomic weights can inhibit the growth of pathogens by disrupting their metabolism.

Terpenes

- Thymol
- Pine oil

Other

- The biguanide polymer polyaminopropyl biguanide is specifically bactericidal at very low concentrations (10 mg/l).
- It has a unique method of action: The polymer strands are incorporated into the bacterial cell wall, which disrupts the membrane and reduces its permeability, which has a lethal effect to bacteria.
- It is also known to bind to bacterial DNA, alter its transcription, and cause lethal DNA damage.
- It has very low toxicity to higher organisms such as human cells, which have more complex and protective membranes.

- Common sodium bicarbonate ($NaHCO_3$) has antifungal properties, and some antiviral and antibacterial properties, though those are too weak to be effective at a home environment.

Non-chemical

- Ultraviolet germicidal irradiation is the use of high-intensity shortwave ultraviolet light for disinfecting smooth surfaces such as dental tools, but not porous materials that are opaque to the light such as wood or foam.
- Ultraviolet light is also used for municipal water treatment. Ultraviolet light fixtures are often present in microbiology labs, and are activated only when there are no occupants in a room (e.g., at night).
- Heat treatment can be used for disinfection and sterilization.

- The phrase "sunlight is the best disinfectant" was popularized in 1913 by United States Supreme Court Justice Louis Brandeis and later advocates of government transparency. While sunlight's ultraviolet rays can act as a disinfectant, the Earth's ozone layer blocks the rays' most effective wavelengths.

- Ultraviolet light-emitting machines, such as those used to disinfect some hospital rooms, make for better disinfectants than sunlight

Home disinfectants

- The most cost-effective home disinfectant is chlorine bleach (typically a >10% solution of sodium hypochlorite), which is effective against most common pathogens, including disinfectant-resistant organisms such as tuberculosis (mycobacterium tuberculosis), hepatitis B and C, fungi, and antibiotic-resistant strains of staphylococcus and enterococcus.
- It has disinfectant action against some parasitic organisms.

- The benefits of chlorine bleach include its inexpensive and fast acting nature. However it is harmful to mucous membranes and skin upon contact, has a strong odour; is not effective against *Giardia lamblia* and *Cryptosporidium*; and combination with other cleaning products such as ammonia and vinegar can generate noxious gases like chlorine.
- The best practice is not to add anything to household bleach except water. As with most disinfectants, the area requiring disinfection should be cleaned before the application of the chlorine bleach, as the presence of organic materials may inactivate chlorine bleach.
- The use of some antimicrobials such as triclosan, is controversial because it may lead to antimicrobial resistance.
- The use of chlorine bleach and alcohol disinfectants does not cause antimicrobial resistance as it denatures the protein of the microbe upon contact

SRI LAKSHMI NARAYANA INSTITUE OF HIGHER EDUCATON AND RESEARCH

Annexure III

Assessment Form

Sri Lakshmi Narayana Institute of Medical Sciences, Puducherry

COURSE CODE:VAC08/AHS/2020-15/06

Multiple choice questions ***20x1=20***

1. …….. Is a chemical substance or compound used to inactivate or destroy microorganisms on inert surfaces**?**
    a) Sterilization
    b) Disinfectant
    c) Sanitizer
    d) None of the above
2. Disinfection does not necessarily kill all microorganisms, especially resistant……
    a) Bacterial spores
    b) Only spores
    c) Viral
    d) None of the above
3. ……are substances that simultaneously clean and disinfect.
    a) Sanitizer
    b) Disinfectant
    c) Sterilization
    d) All of the above
4. ……. means a chemical agent which is used to sterilize critical medical devices or medical instruments
    a) Sterility
    b) Disinfectant
    c) Sterilization
    d) None of the above

5. ……. means a disinfectant that rapidly kills most vegetative bacteria
    a) Low level disinfectant
    b) High level disinfectant
    c) Moderate level disinfectant
    d) Medium level disinfectant
6. High level disinfectant means a disinfectant that kills all……
    a) Bacterial pathogens
    b) Microbial pathogens
    c) Viral pathogens
    d) None of the above
7. ……. Are typically chemical substances capable of disinfecting microorganisms suspended in the air?
    a) Low level disinfectant
    b) Commercial grade
    c) Air disinfectant
    d) High level disinfectant
8. The efficacy of alcohol is enhanced when in solution with the wetting agent……
    a) dodecanoic acid
    b) canonic acid
    c) Canopic acid
    d) decani acid
9. ……. Are strong oxidants and extremely effective disinfectants.
    a) Peroxycarboxylic acids and inorganic proxy acids
    b) Inorganic proxy acids
    c) Aldehydes
    d) None of the above
10. ……. Are active ingredients in some household disinfectants?
    a) Aldehydes
    b) Inorganic peso acids
    c) Phenolic
    d) All of the above
11. Chloroxylenol is the principal ingredient in……
    a) Dettol
    b) Phenyl

c) Lysol
d) Sanitizer

12.…….. derived from the herb thyme
a) Hexachlorophene
b) Thyme
c) Streusels
d) Benzene

13. Chlorine has been used for applications, such as the deactivation of pathogens in ……
a) river water
b) Drinking water
c) Underground water
d) None of the above

14.……. for disinfecting smooth surfaces such as dental tools, but not porous materials that are opaque to the light such as wood or foam
a) Radiations
b) Ultraviolet light
c) X rays
d) None of the above

15. The most cost-effective home disinfectant is…….
a) Dettol
b) Phenyl
c) Chlorine bleach
d) Lysol

16.……is the best disinfectant
a) Sunlight
b) Aldehyde
c) Glutaraldehyde
d) Terpenes

17. Example for inorganic compound disinfectant…….
a) Iodine
b) Chlorine
c) Aldehyde
d) Both a&b

18.……means a disinfectant that kills all microbial pathogens except bacterial endospores, when used as recommended by the manufacturer.

a) Low level disinfectant
b) Intermediate level
c) High level
d) None of the above

19. Alcohols are most effective when combined with…….

a) Normal water
b) Distilled water
c) Drinking water
d) Pool water

20. The use of chlorine bleach and alcohol disinfectants does not cause…….

a) Antimicrobial resistance
b) Antimonial resistance
c) Antimicrobial resistance
d) Antifungal resistance

SRI LAKSHMI NARAYANA INSTITUE OF HIGHER EDUCATON AND RESEARCH

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SRI LAKSHMI NARAYANA INSTITUE OF HIGHER EDUCATON AND RESEARCH

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Sri Lakshmi Narayana Institute of Medical Sciences

Affiliated to Bharath Institute of Higher Education & Research

(Deemed to be University under section 3 of the UGC Act 1956)

CERTIFICATE OF MERIT

This is to certify that **MALATHI.S UAH1804196** has actively participated in the Value Added Course on **Disinfection VAC08/AHS/2020-15/06** held June to July 2020 Organized by Sri Lakshmi Narayana Institute of Medical Sciences, Pondicherry- 605 502, India.

Dr. G.Somasundram

COORDINATOR

RESOURCE PERSON

5Annexure- V

Student Feedback Form

Course Name: DISINFECTION

Subject Code: VAC08/AHS/2020-15/06

Name of Student: _____Roll No.:

We are constantly looking to improve our classes and deliver the best training to you. Your evaluations, comments and suggestions will help us to improve our performance

Feedback Form

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
1. The course met my expectations.	○	○	○	○	○
2. I will be able to apply the knowledge learned.	○	○	○	○	○
3. The course objectives for each topic were identified and followed.	○	○	○	○	○
4. The content was organised and easy to follow.	○	○	○	○	○
5. The quality of instruction was good.	○	○	○	○	○
6. Class participation and interaction were encouraged.	○	○	○	○	○
7. Adequate time was provided for questions and discussion.	○	○	○	○	○

8. How do you rate the course overall?
   - ○ Excellent
   - ○ Good
   - ○ Average
   - ○ Poor
   - ○ Very poor

9. The aspects of the course could be improved?

10. Other comments?

Signature of the student:
Date:

Student Feedback Form

Course Name: DISINFECTION

Subject Code: VAC08/AHS/2020-15/06

Name of Student: Yazhini . P Roll No.: UAH18052O5

We are constantly looking to improve our classes and deliver the best training to you. Your evaluations, comments and suggestions will help us to improve our performance

Feedback Form

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
1. The course met my expectations.	o	o	✓	o	o
2. I will be able to apply the knowledge learned.	o	✓	o	o	o
3. The course objectives for each topic were identified and followed.	o	✓	o	o	o
4. The content was organised and easy to follow.	o	o	✓	o	o
5. The quality of instruction was good.	o	✓	o	o	o
6. Class participation and interaction were encouraged.	o	o	o	✓	o
7. Adequate time was provided for questions and discussion.	o	o	o	o	✓

8. How do you rate the course overall?
   - o Excellent
   - ✓ Good
   - o Average
   - o Poor
   - o Very poor

9. The aspects of the course could be improved? Practical should be conducte more .,

10. Other comments?

Need to improve extra curricular activities, li sports and cultural events.

Signature of the student:
Date: 18/07/20 Yazhini.P

5Annexure- V

Student Feedback Form

Course Name: DISINFECTION

Subject Code: VAC08/AHS/2020-15/06

Name of Student: GAYATHRI V Roll No.: UAH18041194

We are constantly looking to improve our classes and deliver the best training to you. Your evaluations, comments and suggestions will help us to improve our performance

Feedback Form

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
1. The course met my expectations.	o	o	✓	o	o
2. I will be able to apply the knowledge learned.	o	✓	o	o	o
3. The course objectives for each topic were identified and followed.	✓	o	o	o	o
4. The content was organised and easy to follow.	✓	o	o	o	o
5. The quality of instruction was good.	✓	o	o	o	o
6. Class participation and interaction were encouraged.	o	o	o	✓	o
7. Adequate time was provided for questions and discussion.	o	o	o	o	✓

8. How do you rate the course overall?
   - o Excellent
   - ✓ Good
   - o Average
   - o Poor
   - o Very poor

9. The aspects of the course could be improved? Need more Practical Classes

10. Other comments? Classes are very effective.

Signature of the student: Gayathri
Date: 18/07/20

Date: 18.07.2020

From

Dr.G.Somasundram
Department of Pharmacology,
Sri Lakshmi Narayana Institute of Medical Sciences
Bharath Institute of Higher Education and Research,
Chennai.

Through Proper Channel

To

The Dean,
Sri Lakshmi Narayana Institute of Medical Sciences
Bharath Institute of Higher Education and Research,
Chennai.

Sub: Completion of value-added course: DISINFECTION for AHS

Dear Sir,

With reference to the subject mentioned above, the department has conducted the value-added course titled: "**DISINFECTION "** June to July 2020 for 27 AHS Students . We solicit your kind action to send certificates for the participants that is attached with this letter. Also, I am attaching the photographs captured during the conduct of the course.

Kind Regards,

Dr.G.Somasundram

Encl: Certificates

Photographs

SRI LAKSHMI NARAYANA INSTITUTE OF ALLIED HEALTH SCIENCE
MEDICAL EDUCATIONAL PROJECT

DISINFECTION - VAC08/AHS/2020-15/06

S.No.	Name of the Students	University Register Number	Signature
1	AKSHAY SURESH	UAH1803178	
2	ANAGHA SUKUMARAN	UAH1803179	
3	APARNA REMESHAN	UAH1803180	
4	ASHIK.R	UAH1803182	
5	FEBA SUSAN ABRAHAM	UAH1803183	
6	GOKUL A	UAH1803184	
7	JIJI ELZA JOSE	UAH1803185	
8	MINNU MATHACHAN	UAH1803186	
9	MUHAMMED IRFAN.I	UAH1803187	
10	MURALIKRISHNAN.K	UAH1803188	
11	DONALD MORISON.S	UAH1805199	
12	GADDALA PRAVEEN	UAH1805200	
13	PRAVEEN.G	UAH1805201	
14	RAMANAN.V	UAH1805202	
15	SARATH P S	UAH1805203	
16	S.K.DHARSHINI	UAH1804193	
17	GAYATHRI.V	UAH1804194	
18	JAYABHAVANI.J	UAH1804195	
19	MALATHI.S	UAH1804196	
20	NARAYANADASS.M	UAH1804197	
21	SANDRA.S	UAH1803190	
22	SATHISHKUMAR.R	UAH1803191	
23	SHEHANAYI.M	UAH1803192	
24	VENKATESH.S	UAH1805204	
25	YAZHINI.P	UAH1805205	
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SRI LAKSHMI NARAYANA INSTITUTE OF ALLIED HEALTH SCIENCE

MEDICAL EDUCATIONAL PROJECT

DISINFECTION - VAC08/AHS/2020-15/06

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2	ANAGHA SUKUMARAN	UAH1803179	
3	APARNA REMESHAN	UAH1803180	
4	ASHIK.R	UAH1803182	
5	FEBA SUSAN ABRAHAM	UAH1803183	
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7	JIJI ELZA JOSE	UAH1803185	
8	MINNU MATHACHAN	UAH1803186	
9	MUHAMMED IRFAN.I	UAH1803187	
10	MURALIKRISHNAN.K	UAH1803188	
11	DONALD MORISON.S	UAH1805199	
12	GADDALA PRAVEEN	UAH1805200	
13	PRAVEEN.G	UAH1805201	
14	RAMANAN.V	UAH1805202	
15	SARATH P S	UAH1805203	
16	S.K.DHARSHINI	UAH1804193	
17	GAYATHRI.V	UAH1804194	
18	JAYABHAVANI.J	UAH1804195	
19	MALATHI.S	UAH1804196	
20	NARAYANADASS.M	UAH1804197	
21	SANDRA.S	UAH1803190	
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