NATIONAL COLLEGE OF CHEST PHYSICIANS (INDIA)

Lung Bulletin

NEWSLETTER OF NATIONAL COLLEGE OF CHEST PHYSICIANS (INDIA)

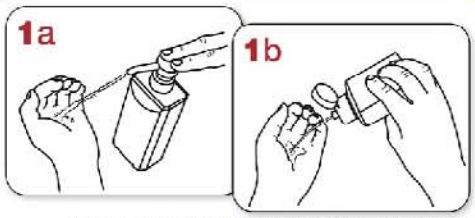
INAUGURAL ISSUE JANUARY - JUNE 2020

THEME - PULMONARY HYPERTENSION

HIGHLIGHTS

- PULMONARY HYPERTENSION
- COVID - 19
- REAL - LIFE CASE REPORTS
- MEMBERS CORNER
- MEMBERSHIP BENEFITS
- OUTSTANDING ACHIEVERS
- ACADEMIC ACTIVITIES
- E - COURSES
- BOOKS
- NEBULIZATION GUIDELINES
- POST - GRADUATE QUIZ
- TRAVEL GRANT
- UPCOMING EVENTS
- NAPCON 2020

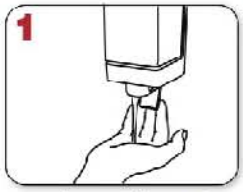
How to handrub?
WITH ALCOHOL-BASED FORMULATION



Apply a palmful of the product in a cupped hand and cover all surfaces.

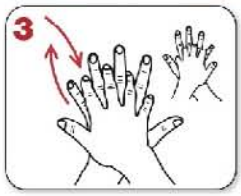
How to handwash?
WITH SOAP AND WATER

Wet hands with water

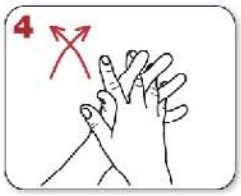


apply enough soap to cover all hand surfaces.

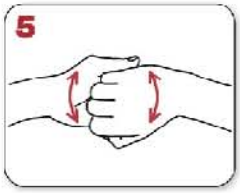
Rub hands palm to palm



right palm over left dorsum with interlaced fingers and vice versa



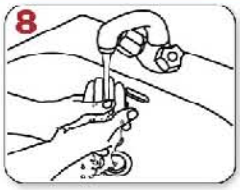
palm to palm with fingers interlaced



backs of fingers to opposing palms with fingers interlocked

rotational rubbing of left thumb clasped in right palm and vice versa

rotational rubbing, backwards and forwards with clasped fingers of right hand in left palm and vice versa

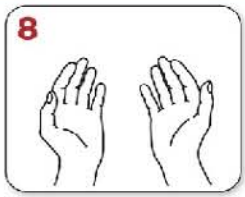


rinse hands with water

dry thoroughly with a single use towel

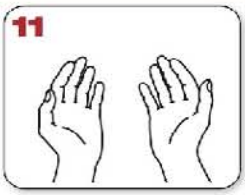
use towel to turn off faucet

20-30 sec



...once dry, your hands are safe.

40-60 sec



...and your hands are safe.

WHO acknowledges the Hôpitaux Universitaires de Genève (HUG), in particular the members of the Infection Control Programme, for their active participation in developing this material.

World Health Organization

NCCP(I) - LUNG BULLETIN
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UPCOMING EVENTS

Sr. No.	DATES	CONFERENCE	VENUE	WEBSITE
	2020			
1.	July 2 - 5	13th World Asthma, Allergy & COPD Forum	St. Petersburg	www.wipocis.org
2.	August 24 - 25	Plenareno Respiratory Conference 2020	Singapore	https://respiratory.plenareno.com
3.	September 2 - 4	13th Asia Pacific Conference on Tobacco or Health	Bangkok	http://www.apact2020.com/home.php
4.	September 7 - 9	European Respiratory Society (ERS) International Congress	Vienna	https://www.erscongress.org
5.	September 17 - 20	JSA/WAO World Allergy Congress 2020	Kyoto	www.worldallergy.org/meetings/wac-2020
6.	September 22 - 25	European Sleep Research Society (ESRS) Congress	Seville	www.esrs-congress.eu/ 2020.html
7.	September 24 - 27	World Congress for Bronchology and Interventional Pulmonology (WCBIP)	Shanghai	www.wabip.com/congress
8.	October 7 - 8	Thrombosis and Thromboembolism 2020	Boston	https://thrombosis.hmscme.com
9.	October 9 - 11	South East Asian Academy of Sleep Medicine (SEAASM) International Conference on Sleep Disorders	Kolkata	https://www.seaasm.org/6th-icsd-2020-kolkata/
10.	October 15 - 17	IASLC North America Conference on Lung Cancer 2020	Chicago	https://www.iaslc.org/Conferences-Events/
11.	October 17 - 21	American College of Chest Physicians (ACCP) CHEST Annual Meeting	Chicago	https://chestmeeting.chestnet.org
12.	October 21 - 24	51st Union (IUAT-LD) World Conference on Lung Health	Seville	https://seville.worldlunghealth.org
13.	November 16 - 17	International Conference on Frontiers In Lung Cancer	Brisbane	https://lung-cancer.cancersummit.org
14.	November 19 - 22	54th Conference of the Indian College of Allergy, Asthma and Applied Immunology	Hyderabad	https://www.icaai.net
15.	December 2 - 4	British Thoracic Society (BTS) Winter Meeting	London	https://brit-thoracic.org.uk
16.	December 17 - 19	4th World Bronchiectasis and NTM Conference	Barcelona	http://www.world-bronchiectasis-conference.org
17.	December 20 - 22	75th National Conference on Tuberculosis and Chest Diseases (NATCON)	Indore	http://tbassnindia.org
	2021			
18.	January 21 - 24	76th Annual Conference of the Association of Physicians of India (APICON)	Jaipur	https://www.apicon2021jaipur.com
19.	January 27 - 31	**NAPCON 2020** [22nd National Conference on Pulmonary Diseases - Joint National Conference of National College of Chest Physicians (India) and Indian Chest Society]	VIRTUAL	https://www.virtualnapcon2020.com Write to napcon2020virtual@gmail.com
20.	February 24 - 28	27th Annual Conference of Indian Society of Critical Care Medicine (CRITICARE)	Ahmedabad	http://criticare.isccm.org/criticare2021
21.	May 14 - 19	American Thoracic Society (ATS) International Conference 2021	San Diego	https://conference.thoracic.org

NATIONAL COLLEGE OF CHEST PHYSICIANS (INDIA)

DEAR COLLEAGUES,

AS MEMBERS / FELLOWS OF NATIONAL COLLEGE OF CHEST PHYSICIANS (INDIA),

ARE YOU GETTING...

E-voting form sent to Your E-mail to Vote in Yearly Elections to NCCP(I) Governing Council ?

Communications through E-mail and invitations to attend NCCP(I) Annual General Body Meeting (AGM) ?

Indian Journal of Chest Diseases and Allied Sciences (Quarterly issues) by Post ?

NCCP(I) National Directory of Chest Physicians (Every 5 years) ?

IF THE ANSWER TO ANY OF THESE IS

NO

HAVE ANY OF THESE CHANGED...

E-mail ID or Address ?

Mobile Number ?

Postal Address ?

Residence ?

Clinic or Hospital ?

Institution or Place Where You Work ?

IF THE ANSWER TO ANY OF THESE IS

YES

THEN IT'S TIME TO UPDATE YOUR COMMUNICATION DATA IN OUR RECORD !

Please send an E-mail to Prof. Dr. S. N. Gaur, Secretary, NCCP(I) to **sngaur9@gmail.com** mentioning Your Name and NCCP(I) Life-Membership or Life-Fellowship Number and providing the contact details below with a request to update Your information in NCCP(I) record :

1. Active Mobile Number
2. Working E-Mail ID
3. Complete Postal Address (with Landmark, Street, District, City and PIN-CODE)

Should You need any assistance or have any queries regarding Your NCCP(I) Membership or Benefits, feel free to contact us. Our Support is always available to help You!

COMMUNICATE WITH US

www.nccpindia.org

Dr. S. N. Gaur, Gaur Clinic, 130 - A, Patparganj Village, Delhi – 110091

sngaur9@gmail.com , ncsarangdhar@rocketmail.com

(+91) 9811271916 , (+91) 9029429015

From The Desk of President, NCCP(I)

Prof. Dr. P. D. Motiani
President, NCCP(I) (2020-2021)
Retd. Senior Professor & Head (Pulmonary Medicine), Dr. S. N. Medical College, Jodhpur, Rajasthan
Organising Chairman, NAPCON 2010
Recipient of NCCP(I) German Remedies Chest Oration and
NCCP(I) Rajasthan Chapter - Prof. S. N. Gaur Oration
E-mail : drpdmotiani@gmail.com

Dear Colleagues,

It is with immense pleasure that National College of Chest Physicians (India) [NCCP(I)] is bringing out its first Newsletter to update the knowledge in the field of Pulmonary Medicine for our professional colleagues. Pulmonary Medicine is a rapidly developing specialty of Medicine in the country and includes, besides Pulmonary Tuberculosis which is posing such a grave challenge that the Prime Minister of India had to announce a battle against it and rename RNTCP (Revised National Tuberculosis Control Programme) as NTEP (National Tuberculosis Elimination Programme), Obstructive Lung Diseases, Interstitial Lung Diseases, Occupational Lung Diseases, Lung Malignancies, Interventions, etc. which require extensive research work and knowledge which has to be spread for awareness and utilised for better management .

Currently COVID-19, the pandemic disease which originated from Wuhan city, Hubei province , China has spread rapidly throughout the world being highly communicable with mortality of 3 to 5 percent and its complications pose a great challenge . We, the Pulmonologists have to impart our duties to educate and sensitize the fraternity to make citizens follow the health advisories by government and local administration.

The NCCP(I) Newsletter is a progressive step taken in the right direction to acquaint our budding Chest Physicians of tomorrow with existing knowledge and current status of events occurring in our field today and also to provide all of us an opportunity to interact with each other for the exchange of ideas and knowledge.

I would like to take this opportunity to express my sincere gratitude to everyone involved in the National College of Chest Physicians (India) , all its Governing Council Members as well as Members and Fellows of the College and I look forward to your support to take NCCP(I) to greater heights .

I wish all success for the first Newsletter by NCCP(I) on Pulmonary Hypertension – a challenge to the Pulmonary Fraternity to diagnose early and manage along with its primary disease for better relief of symptoms which requires a great deal of skill. The Newsletter will definitely go a long way forward towards increasing awareness about clinical presentation, diagnosis and management of Pulmonary Hypertension in the medical profession.

On behalf of NCCP(I) as well as on my personal behalf, I congratulate Dr. Nikhil Sarangdhar for his efforts in bringing out the NCCP(I) Newsletter.

From The Desk of Immediate Past-President, NCCP(I)

Prof. Dr. Surya Kant
Immediate Past-President, NCCP(I) (2019-2020)
Professor & Head (Respiratory Medicine), King George Medical University, Lucknow, U.P
President, Indian College of Allergy Asthma and Applied Immunology (2018-2020)
Former President, Indian Chest Society (2016-2017),
Member, National Task Force & Chairman (North Zone), Zonal Operational Research Committee, NTEP
Convener, TB, Tobacco and Pollution Free Lucknow
E-mail : skantpulmed@gmail.com

Dear Colleagues,

National College of Chest Physicians (India) [NCCP(I)] was founded in 1959 as the first association of Chest Physicians in India. Over years, Pulmonary Medicine has not only progressed tremendously but also established itself as a very important super specialty in India. A large number of Pulmonologists are trained in various institutions in India. I am deeply honoured to serve as the President of such an outstanding association and leading a board composed of brilliant medical fraternity and friends.

I would like to begin by expressing my gratitude to everyone involved in the College whether you are or were a member, fellow, officer, delegate, participant or support staff. NCCP(I) is truly a success story today because of your commitment, enthusiasm and collective contributions.

I am committed to fulfil all obligations for the growth of this forum. I believe that our College does a number of things very well - it enables collaboration and sharing of knowledge while providing education, research networking and career development opportunities to our members. It nurtures early career members as leaders of the future and offers them learning and funding opportunities. It consults with and gives a voice to our patients, and is always ready to adapt to new needs and changes in our society and environment.

Our primary mission is to promote fraternity and community medical health and education in the rapidly changing environment of a global and digital world - a world in which information recognizes no boundaries, a world filled with promise for improving patient health care, a world in which standardization of clinical practice will drive the future of Pulmonary Medicine.

In this context NCCP(I) is bringing out its very first Newsletter dedicated to the topic 'Pulmonary Hypertension' aimed at updating knowledge of our professional colleagues on various respiratory diseases, acquainting them with current events of interest occurring in our field and also providing them a common platform to interact with each other to exchange their ideas, knowledge and experiences. Pulmonary Hypertension (PH) carries a poor prognosis if not promptly diagnosed and appropriately treated and frequently complicates the course of patients with lung disease. PH is invariably associated with reduced functional ability, impaired quality of life, greater oxygen requirement and an increased risk of mortality.

I would like to congratulate and thank the Editor, NCCP(I) Newsletter Dr. Nikhil Sarangdhar for this great initiative and a more active official role within NCCP(I).

From The Desk of Secretary, NCCP(I)

Prof. Dr. S. N. Gaur
Secretary, NCCP (I)
Organising Chairman, NAPCON 2020
Professor & Head, Department of TB & Respiratory Diseases, School of Medical Sciences & Research, Sharda University, Greater Noida, NCR Delhi
Former Director (Acting), Vallabhbhai Patel Chest Institute, University of Delhi
Recipient of 12 national awards and other academic honours including Commonwealth Fellowship
Chairman, Allergen Standardization Committee, Government of India
E-mail : sngaur9@gmail.com

Dear Colleagues,

The National College of Chest Physicians (India) [NCCP(I)] is a registered body functioning to promote the cause of Chest Diseases and Allied Sciences in India and to take this specialty forward in the field of Medicine. It was formed originally with 58 founder members as the Indian Association of Chest Diseases (IACD) in 1959 at the Indian Science Congress. The IACD in its meeting held on November 15, 1979 subsequently ratified by the General Body meeting held on November 6, 1979, unanimously decided to change the name of IACD to National College of Chest Physicians (India) and to make consequential changes/amendments in the memorandum of the Association, and its rules and regulations by a sub-committee, duly constituted for this purpose and the recommendations were confirmed and approved by the prescribed authority and confirmed at a subsequent special meeting of the General Body held on August 14, 1980. The National College of Chest Physicians (India) thus came into being in January, 1981. Since then, it has grown from strength to strength and currently has on its roll more than 1800 Members and 300 Fellows, making it one of the largest national registered professional medical associations, contributing to the development of the specialty of Pulmonary Medicine since its inception. The mission of NCCP(I) is to promote academic growth, partnership and collaboration for education in a rapidly developing world and develop strategies for better clinical practice in Pulmonary Medicine.

The NCCP(I) official website is www.nccpindia.org. The Indian Journal of Chest Diseases and Allied Sciences is the official publication of NCCP(I) and is published jointly with Vallabhbhai Patel Chest Institute, Delhi. This journal is indexed and has been widely acclaimed at both national and international levels. In addition, the NCCP (I) publishes a Directory of Chest Physicians, which is updated every 5 years.

Under the convenorship of Dr. Rajesh Chawla, Past President of NCCP(I), the College has launched two E-courses - Comprehensive Pulmonary Medicine E-course (CPMeC) and Interventional Pulmonology E-course (IPeC) for the benefit of post-graduates and clinicians practising in the specialty. The CPMeC was the first online course in Pulmonary Medicine in India accredited by the National Board of Examinations, New Delhi and met with resounding success, having nationwide enrolment of more than 1400 doctors . IPEC has been launched last year. NCCP(I) in collaboration with ICS has also developed guidelines for Pneumonia, Vaccination, ILD, COPD, Bronchoscopy, Spirometry, and the progress is going on for Guidelines of Pleural Diseases, Medical Thoracoscopy and revised COPD guidelines. NCCP(I) has also developed National guidelines on Nebulization therapy. NCCP(I) also encourages original research by young scientists and consultants by providing travel grants to all members and fellows for upgrading their knowledge by attending national and international conferences (ACCP, ATS , APSR, Gulf Thoracic and others).

Ever since its inception, the College held 33 conferences with the Association of Physicians of India and since the 28thconference, it has organized its annual conferences (NACCON) independently. These conferences were highly successful and were chaired by the President of NCCP(I). From 1999, the NCCP(I) with ICS is having Joint National Conference on Pulmonary Diseases – NAPCON. I am happy to inform you that all the last twenty-one NAPCONs were a grand success, appreciated by the delegates and international faculty. I am sure that the same spirit will continue and we will have more and more participation as well as better conferences in future. This year, NAPCON-2020 is being organized and as in the past, we are expecting a good number of foreign faculties from ACCP, ATS, ERS, APSR, Gulf Thoracic Society and from neighboring countries. I have full confidence that NAPCON-2020 will be organized with best efforts in a manner to make it a most memorable event.

The NCCP(I) has decided to publish its Newsletter aimed at updating current knowledge about various respiratory diseases, to acquaint our young enthusiastic Post-graduates and Chest Physicians with events of interest occurring in our specialty and also provide them a platform to interact with each other and to participate in the exchange of knowledge. The newsletter will be published twice-yearly with each issue dedicated to a different topic.

On behalf of the National College of Chest Physicians (India) as well as on my personal behalf, I congratulate Dr. Nikhil Sarangdhar, who is the Editor, NCCP(I) Newsletter for his hard work in bringing out the Newsletter, which I am confident will be appreciated by all our colleagues in the field. I am sure that this endeavour will be useful and I wish the NCCP(I) Newsletter all success.

From The Desk of Chairman, Scientific Committee, NAPCON 2020 and Academic Forum, NCCP(I)

Prof. Dr. S. K. Katiyar
Chairman, Scientific Committee, NAPCON-2020 & Academic Forum, NCCP(I)
Zonal Chairman (Central Zone), NCCP(I) , Lifetime Achievement Awardee, NCCP(I)
Gold Medal Awardee, Tuberculosis Association of India & U.P. TB Association
Formerly
Principal & Dean, Professor & Head, Department of Tuberculosis & Respiratory Diseases,
G.S.V.M. Medical College & C.S.J.M. University, Kanpur
President, NCCP(I) (2003-2004); TB Association of India (2007-2008); ICS (2009-2010)
Chairman, Scientific Committee, NAPCON-2014, 2016 & 2018 & Organizing Secretary, NAPCON-2000
E-mail : skkatiyar.napcon@gmail.com

Dear Colleagues,

It is my great pleasure to extend heartfelt greetings to the readers of the first issue of the Newsletter of National College of Chest Physicians (India). I congratulate Dr. Nikhil Sarangdhar, Editor, NCCP(I) Newsletter for his efforts in bringing out the inaugural issue of this bi-annual publication, which is not just a newsletter, but much beyond, in terms of its rich updated scientific contents. Each issue is being dedicated to one disease of clinical interest, this time 'Pulmonary Hypertension', with the aim to have a comprehensive coverage of all its clinical aspects and making it more case oriented also. This will not only attract our younger members, but all others too, to update their knowledge on the specific disease. Efforts of the entire Editorial Board and the Governing body are commendable and need appreciation for this splendid effort.

The NCCP(I) Newsletter – Lung Bulletin will also prove useful to the members to keep them informed and updated on the news, events, reports and other information. The bulletin will also bridge the gap between the members and the College and become a medium of communication between the two, who otherwise, can only learn about the achievements and activities of the College during the annual general body meeting held once a year during the conference. The newsletter is a media for the members through which they can share their information, knowledge, experiences and concerns. Further it will also help to connect the members promoting better understanding and cooperation.

As Chairman of the Scientific Committee of NAPCON – 2020, it is my proud privilege and honour to invite and welcome you all to this year's conference and I can assure that you are going to witness one of the best scientific programs, which will be rich in its contents and purposeful too, to entirely change the perspective of your day to day clinical approach.

I wish all the readers of the NCCP(I) Newsletter an enriching and informative reading experience and will welcome their feedback on this new communication. My best wishes to Dr. Nikhil Sarangdhar and his editorial team for grand success of the new venture.

Please Take Care, Stay Safe and Healthy during this COVID-19 crisis.

From The Desk of Editor, NCCP(I) Lung Bulletin

Dr. Nikhil Sarangdhar
Editor, NCCP(I) Lung Bulletin
Organising Secretary, NAPCON 2020
Former Assistant Professor, Department of TB & Chest diseases, K. J. Somaiya medical college, Mumbai
Organising Secretary, NAPCON 2016 & Member, Scientific Committee, NAPCON 2016, 2018, 2019 & 2020
Young Scientist Awardee of the Indian College of Allergy Asthma and Immunology (2011, 2014 & 2015), Association of Physicians of India (2015), Indian Chest Society (2015), National College of Chest Physicians-India (2017)
E-mail : ncsarangdhar@rocketmail.com

Dear Colleagues,

When we look back and reflect on the scope of medical education in Pulmonary Medicine in India, we realise we are a vast and diverse nation home to the world's second largest population with an equally cumbersome burden of respiratory diseases, and though we have more medical colleges and specialty centres with better infrastructure today, the healthcare needs of a large section of our population remain unmet, a challenge compounded further by the paradigm shift from communicable to non-communicable diseases.

Everything is dynamic and constant change is the law of nature. As the world evolves, change encompasses all aspects of human life and interaction, so does the exchange of knowledge and ideas traverse all boundaries, facilitated by the digital shift in technology, particularly in the field of medicine with the aim to improve healthcare services by elevating global standards of medical practice. National College of Chest Physicians (India) [NCCP(I)] recognizes the ever growing scope and potential of Pulmonary Medicine in India and seeks to tap the pool of knowledge, skill and talent available to keep up with the growth of our field nationally and globally.

The news that all students and practising specialists of Pulmonary Medicine, both the young and the elderly, are going to be provided a common academic platform ignites a scientific temper which spreads like fire and inculcates an overwhelming desire in them to come together and interact by sharing their ideas, knowledge and experiences with each other. It is keeping this objective in mind that the National College of Chest Physicians (India) launches its Newsletter 'NCCP(I) Lung Bulletin' to encourage and give a voice to this scientific temper, especially in the young budding pulmonologist with a futuristic outlook.

Besides providing a platform for interaction with all our colleagues, NCCP(I) Lung Bulletin also aims to update our knowledge and keep us acquainted with current events of interest in Pulmonary Medicine through articles written by senior colleagues as well as young experts across the length and breadth of India, from Kashmir to Kanyakumari and Dwarka to Dibrugarh for a truly national outlook. Each issue is bifurcated into two sections, a general section abundant in academic content including editorials and reviews on guidelines, practice changing research and other developments in our field, followed by a specific section dedicated to one disease or area of interest in Pulmonary Medicine with technical information about basic sciences supplemented by interesting real-life case reports to ensure a unique amalgamation of knowledge, experience and skill. Lung Bulletin is meticulously compiled with an integrated and systematic approach to ensure that every issue is unique, with the ultimate goal of providing a comprehensive all-in-one review and up-to-date source of information on the subject to the reader.

As we move on from the old to the new, the scientific mind is gripped with a thirst for information that can only be quenched from a large ocean of knowledge about recent advances in traditional as well as new vistas of Pulmonary Medicine. I am pleased to announce that our very first issue is dedicated to the theme 'Pulmonary Hypertension' and has been concocted with a novel flavour to satisfy the taste buds of information in our young readers by garnishing scientific knowledge with a dressing of case reports rich in clinical experience and academic discussion in a dynamic attempt to preserve, emphasize and cherish the clinical approach in today's era of evidence-based medicine.

NCCP(I) Lung Bulletin will be regularly published on a biennial basis with the aim to make it a highly popular and sought after publication. We are confident that it will be received with unparalleled excitement and enthusiasm by all members and fellows of our fraternity who eagerly await its launch. We strive to maintain our Indian tradition of the 'personal touch' at all levels while compiling Lung Bulletin and welcome inputs from all post-graduate medical students, teachers and consultants in the field of Pulmonary Medicine. Please feel free to write to me at ncsarangdhar@rocketmail.com.

I take this opportunity to express my gratitude to the National College of Chest Physicians (India) for entrusting me with the responsibility of compiling and publishing NCCP(I) Lung Bulletin. I am personally grateful for the unconditional support and encouragement extended by the Governing Council of NCCP(I), particularly Prof. Dr. P. D. Motiani (President), Prof. Dr. Surya Kant (Past-President), Prof. Dr. S. N. Gaur (Secretary) and Prof. Dr. S. K. Katiyar (Chairman, Scientific Committee and Academic Forum) as well as all our Members and Fellows. I thank our authors and contributors for not only being prompt in the submission of their articles and case reports but also for being accessible, enthusiastic, cooperative and supportive like a family throughout this endeavour, especially in these turbulent times when COVID-19 ravaged the world. Lastly, I place on record the personal feedback and appreciation given by everyone in support of our endeavour which made it possible for us to publish Lung Bulletin in the most scientific and professional manner. I am confident we will together succeed in driving Lung Bulletin to greater heights to propel the ever-expanding future of Pulmonary Medicine in our country.

MEMBER'S CORNER

I am glad to note that the NCCP (I) is planning to bring out a regular News Letter starting from this inaugural issue. As the oldest Association of Chest Physicians of India having many long years of standing, and playing a vital role in moderating and shaping the academic and practicing career of almost all Chest Physicians of the country, I am sure this News Letter will bring up to date information on the subject and about the College. A regular interaction with good scientific feast will further the scientific temperament of its Members and Fellows and bring the whole NCCP (I) family more closely to each other along with the management. I am further delighted to note that it is being spearheaded by Dr. Nikhil Sarangdhar, a young, dynamic and enthusiastic Chest Physician under the able guidance of old hands of the College. I wish all Success for the NCCP(I) News Letter and a Better and Bright Future!

Padma Shri Dr. D. Behera - OSD, AIIMS Rae Bareli; Sr. Professor, Department of Pulmonary Medicine, Former Dean (Research), Former Chairman of Medical Departments (Group B), PGIMER Chandigarh, Chairman, National Task Force, National Tuberculosis Elimination Programme (NTEP) Former President, National College of Chest Physicians (India)

It is a matter of great pleasure that NCCP(I) is going to release the first issue of its Newsletter on Pulmonary Hypertension (PH). There has been phenomenal improvement in our understanding on PH recently, with better awareness, improved imaging techniques and greater availability of CT scan & Echocardiography in Respiratory Practice. Since the symptoms and signs of PH in early stages are very vague and subtle, cautious evaluation and follow up particularly in those with disproportionate breathlessness and exercise capacity limitation would surely detect such cases. There is need for establishing our own national PH registry to improve our approach and alleviate suffering of the affected. The topics covered in this Newsletter will definitely update knowledge and stimulate the thought process among readers. I express my gratitude to all the learned contributors. Wish You all Happy Reading !

Dr. Ramakant Dixit - Sr. Professor & Head, Department of TB & Respiratory Diseases, J.L.N. medical college, Ajmer

Dear Dr. Nikhil Sarangdhar, the publication of a Newsletter by NCCP(I) is an enterprising step in the right direction. This provides a platform to channelize and communicate thoughts and creativity through various expressions. It also is a means to highlight the success and achievements in the College's pursuits. I truly cannot think of a more accomplished person than yourself to shoulder this mammoth responsibility. Your intimate knowledge of the working of oldest and most prestigious body of Chest Physicians of India combined with your sincere, innovative and unprejudiced approach will without doubt be the wind of change. Congratulations to NCCP(I) and You for a New Beginning and a Smash Hit !

Dr. Nasser Yusuf - Associate Professor, Department of Cardiothoracic Surgery, Sunrise hospital, Kochi, Chest hospital, Calicut and Adjunct Faculty, Kasturba medical college, Manipal

It gives me immense pleasure to write for the NCCP(I) Newsletter. We, the Pulmonary and Critical care providers are now at the forefront of health care during this COVID-19 pandemic, as our patients and society as a whole rely on our efforts. Amidst this crisis, there is renewed appreciation for the work that all of us do. It is an opportunity for National College of Chest Physicians (India) to take the lead and help ensure that our profession and our health care systems emerge stronger !

Dr. Naveed Shah - Professor & Head, Department of Pulmonary Medicine, Government medical college, Srinagar

Hearty Congratulations to all the Governing Council members of our National College of Chest Physicians (India) and Editor, NCCP(I) Newsletter for this great initiative of NCCP(I) Newsletter - Lung Bulletin. It covers very nicely recent updates related to topics on Pulmonary, Critical Care and Sleep Medicine, with a special focus on Pulmonary Hypertension. It will be highly beneficial to all post-graduate medical students of Pulmonary Medicine as well as practising Chest Physicians and Critical Care specialists. I wish for its' great success !

Dr. Deependra Kumar Rai - Additional Professor & Head, Department of Pulmonary Medicine, All India Institute of Medical Sciences (AIIMS), Patna

I am extremely pleased to note that NCCP(I) has taken the initiative of coming out on regular basis with a News Letter under the editorship of young and dynamic Dr. Nikhil Sarangdhar, for keeping all concerned abreast with various activities of the organisation. Undoubtedly NCCP(I) is a pioneer scientific body for the advancement of Respiratory Medicine in India today with many credits in its chequered history dating back to 1959, when this association was founded. Keeping in tune with contemporary health dynamics, it is indeed, most appropriate that this inaugural issue of the News Letter is devoted to many hot topics of the day, including an article on the COVID-19 pandemic with emphasis on Indian experience in tackling this devastating global emergency, which in a short span has taken the entire world by storm causing immense upheaval. I am sure the NCCP(I) News letters will be of immense educational value to all those who are intimately connected with the management of respiratory illnesses !

Lt. Gen.(Retd) Dr. BNBM Prasad, SM,VSM - Vice-President, National College of Chest Physicians (India)
Former DGHS (Hospital Services), Armed Forces and President's Honorary Surgeon
Professor, Department of Pulmonary Medicine, K.G.M.U. Lucknow

Dear Colleagues, Hope you are all well and safe during these trying times. Amidst such a terrible disheartening crisis of COVID-19, it feels nice to know about the positive initiative taken by the National College of Chest Physicians (India) in bringing out the NCCP(I) Newsletter. The Newsletter will surely be a great resource of scientific content, appealing to practitioners and students, senior stalwarts and budding physicians, all alike. I would request all to keep contributing to the NCCP(I) Newsletter and help to make every issue a rich reference source and academic guide which everyone would like to have on their office desks. I wish the Editorial Team all success for this endeavour and look forward to reading the first issue soon. Wishing everyone safety and good health !

Dr. Raj Bhagat - Associate Professor, Department of Medicine, G.C.S. medical college, Ahmedabad
Joint Secretary, National College of Chest Physicians (India)
Secretary, Association of Chest Physicians of Gujarat

I learnt about the launch of the Newsletter of National College of Chest Physicians (India). I'm so happy to see that the NCCP(I) Newsletter is off to a running start. Congratulations to NCCP(I) on this new venture of starting a Newsletter. Innovation is one of the themes that many of those seeking broader global rankings in academics would like to be able to include. This is the most comprehensive attempt to capture the objectives. I'm so proud to be a member of the esteemed college, wherein great academicians with sharp intellect are the driving force. NCCP(I) has always been a leader and I have no doubt you'll lead this new venture to success. I have every confidence that the NCCP(I) Newsletter will succeed in becoming a very savvy and innovative trendsetter !

Dr. Ravindra M Sarnaik - Director, Leela Mores' Chest Clinic, Nagpur
Chairman, NCCP(I) Maharashtra State Chapter

Greetings ! As a member of our esteemed National College of Chest Physicians (India), I would like to convey my best wishes for the launch of the educational and highly informative series of NCCP(I) Newsletter. It is indeed a great platform for great minds to congregate, share, amalgamate and spread their knowledge with each other. I am sure the recent updates and topics covered in this Newsletter with a specific focus on Pulmonary Hypertension will definitely update knowledge and stimulate the thought process, particularly among young readers. I look forward to all its issues !

Dr. Tanushree Gahlot - Consultant and in-charge, Department of Pulmonary Medicine,
Yatharth Superspeciality Hospital, Greater Noida, U.P.

National College of Chest Physicians (India) is the perfect platform for Young Pulmonologists like Me as it encourages us to undertake research activities, guides us in our career which is so important early on and leads by example in the field of Pulmonology with stalwarts at the helm.
The NCCP(I) Newsletter - Lung Bulletin is a superb initiative and will help us to be up to date with the activities undertaken by NCCP (I), recent updates worldwide in the field of Pulmonology and future prospects. I am sure under the able leadership of Dr. Nikhil Sarangdhar and the Editorial Board, the NCCP(I) Newsletter will be a huge success and will be something we all look forward to eagerly.
I, for certain am very excited and earnestly await its launch !

Dr. Avya Bansal - Consultant Chest Physician, Bombay Hospital, Mumbai

MEMBER'S CORNER (INTERNATIONAL)

Dear Dr. Nikhil Sarangdhar,

It is heartening to learn that the National College of Chest Physicians (India) [NCCP(I)] is publishing its Newsletter aimed at updating the professional knowledge of physicians on various respiratory diseases.

National College of Chest Physicians (India) is an Institution exceptional in its diversity and expertise of professionals in the wide arena of Pulmonary Medicine and the NCCP(I) Newsletter is a long-awaited event. I am sure, rather I have a firm belief that the NCCP(I) Newsletter will provide a comprehensive platform to share knowledge among our colleagues and provide updates on Pulmonary Medicine.

It is matter of great honor and privilege to write a message for the first issue of the NCCP(I) Newsletter. I gratefully appreciate your commendable efforts towards this endeavour. As a fellow of NCCP(I), I extend My Heartfelt Congratulations and Best Wishes to You and the Editorial Team in bringing out this Newsletter and Wishing You all the Best on your next project !

Dr. Narendra Bhatta - Professor & Head, Department of Pulmonary, Critical Care & Sleep Medicine
B. P. Koirala Institute of Health Sciences (BPKIHS), Dharan, Nepal

Dear Dr. Nikhil Sarangdhar,

I am delighted to learn that the National College of Chest Physicians (India) [NCCP(I)] is bringing out its Newsletter aimed at promoting professional collegiality among the clinicians and updating their knowledge about different respiratory illnesses.

I congratulate the Editorial Board for bringing out this newsletter. NCCP(I) has the reputation of being an Outstanding Academy of Pulmonary Medicine. I gratefully remember the academic contents of many NAPCON's organized under NCCP(I) leadership. I am sure that this Newsletter will provide the platform to connect Pulmonary professionals worldwide and provide recent advances and updates occurring in the field of Pulmonology.

I feel honored to write a message for the first issue of the NCCP(I) Newsletter. I send My Best Wishes to You and All Members of the Editorial Board on the occasion of publication of this Newsletter and extend My Greetings !

Dr. Nisha Keshary Bhatta - Professor & Chair, Division of Neonatology, Department of Pediatrics,
B. P. Koirala Institute of Health Sciences (BPKIHS), Dharan, Nepal

Dear Colleagues,

As a Fellow of National College of Chest Physicians (India), I feel elated to know that NCCP(I) is going to launch its very first Newsletter. NCCP(I) is one of the oldest association of Chest Physicians with an outstanding reputation nationally as well as internationally and has played a key role in fostering the growth of many budding Pulmonologists during their professional careers in India and abroad.

The objectives of NCCP(I) Newsletter are many, for one, it will acquaint our colleagues with the academic endeavours and activities of NCCP(I), keep them updated about different respiratory diseases and current events as well as bring us all together on a single platform to exchange views, ideas and achievements for professional growth like a fraternity.

I congratulate NCCP(I) and the Editor, NCCP(I) Newsletter Dr. Nikhil Sarangdhar for their efforts in bringing out the first issue, which I am sure will prove to be a very popular publication rich in academic content that will benefit all our colleagues and post-graduate students alike and will acquire an outstanding momentum which will be kept up with subsequent issues dedicated to specific topics. My Best Wishes for the grand success of this novel venture.

Dr. Vikram Sarbhai - Specialist in Pulmonology, R.A.K. Hospital, United Arab Emirates
Senior Consultant, Pulmonology Critical Care and Sleep Medicine, National Heart Institute, New Delhi

NATIONAL COLLEGE OF CHEST PHYSICIANS (INDIA)

A PROFESSIONAL SOCIETY

for Continuing Education and Research in

RESPIRATORY DISEASE & ALLIED SCIENCES

NCCP(I) MEMBERSHIP DRIVE

President : Dr. P. D. Motiani

Secretary : Dr. S. N. Gaur

Convenor, Membership drive : Dr. S. K. Katiyar

Co-Convenor, Membership drive : Dr. Nikhil Sarangdhar

BECOME A MEMBER TODAY

COMMUNICATE WITH US

www.nccpindia.org

Dr. S. N. Gaur, Gaur Clinic, 130 - A, Patparganj Village, Delhi – 110091

sngaur9@gmail.com , ncsarangdhar@rocketmail.com

(+91) 9811271916 , (+91) 9029429015

MEMBERSHIP BENEFITS

1. Discounted Registration for NCCP(I) Members and Fellows at NAPCON.
2. Discounted Course fee for NCCP(I) Comprehensive Pulmonary Medicine E-Course (CPMeC) and NCCP(I) Interventional Pulmonology E-Course (IPeC) [Course Website : https://chestcourses.org].
3. Opportunity to participate and present your original research work at national conference (NAPCON) with travel grant for NCCP(I) - Prof. Dr. S. N. Gaur Young Scientist Award.
4. Travel Grant for International Conferences (Rs. 80,000/- for U.S. & Canada & Rs. 60,000/- for other countries) and National Conferences (Rs. 20,000/-) each year.
5. Lifelong subscription to quarterly issues of Indian Journal of Chest Diseases and Allied Sciences, one of the top rated and cited indexed journals of Respiratory Medicine.
6. Lifelong subscription to biennial issues of NCCP(I) Newsletter Lung Bulletin.
7. Lifelong subscription to Directory of Chest Physicians (updated every 5 years).
8. Opportunity to avail of the Prestigious NCCP(I) Fellowship.
9. Opportunity to participate in Research Activities conducted under aegis of NCCP(I).
10. Upgradation of Knowledge and Technical Skills by attending accredited Conferences, Workshops and CME programmes organised under the aegis of NCCP(I).
11. Opportunity to Associate, Collaborate and have One-to-One interaction with the top level practising Clinicians and Researchers in Pulmonary Medicine in India .
12. Vote during Elections and Introduce New Members at Annual General Body Meeting during NAPCON.

TAKE A TOUR OF OUR WEBSITE www.nccpindia.org

National College Of Chest Physicians (India)

(Formerly Indian Association for Chest Diseases)

V. P. Chest Institute, University of Delhi, Delhi - 110007

MEMBERSHIP ENROLMENT FORM

Regd No.:S/1421 (1981)

Send both **Membership Form and the Directory Entry Form (see overleaf),** completed and signed along with supporting documents (Degree & Medical Council Registration Certificate), photograph and payment by DD/Cheque for Rs. 7080/- in favour of **"National College of Chest Physicians (India)"** by post to :

Dr. S. N. Gaur , Gaur Clinic, 130- A, Patparganj Village, Delhi - 110091.

Instructions :

1. Entries in Boxes should be in Capital letters Only.
2. Information in Cols 1 to 5 and Cols 15, 16 are Mandatory and should be in Capital Letters only.
3. DD/Cheque should be drawn in favour of "National College of Chest Physicians (India)" payable at Delhi.
4. All correspondence and the IJCDAS (Journal) will be dispatched at your Mailing address.
5. Filled applications to be sent to Prof. S. N.Gaur, GAUR Clinic, 130-A, Patparganj Village, Delhi 110091.

To ,

The Secretary,
National College of Chest Physicians (India)

Dear Sir,

I request that I may be enrolled as a Member of National College of Chest Physicians (India). The Annual Subscription of Rs. 7080/-, Life Membership fee Rs.5000/- and Enrolment fee of Rs. 1000/- + GST 18% (Rs.1080) (Total Rs.7080/-) is enclosed herewith by Cash / Cheque / Demand Draft.

DD/Cheque No: ..... Date: ..... Amount Rs.7080/- Drawn on .....
.....
.....Name of the Bank and address

1.

Applicant's Surname	
First Name	
Middle Name	

2.

Marital Status	

3.

Date of Birth		**Place of Birth**	

D D M M Y Y Y Y

4.

Permanent Address:		**City**	
	State		**PIN**

5.

Mailing Address*:		**City**	
	State		**PIN**

6. Telephone / Fax (with Area Code)

Residence:		**Office:**	
Fax:		**Mobile:**	

7.

E-mail Address:	

8. Medical Education : (ENCLOSE COPIES OF DEGREE / DIPLOMA)

Degree/ Diploma	Name of the College /University	Qualifying Year

9. Experiences in Chest Speciality :

10. Any Other Experience :

11. Affiliation to other Scientific Bodies :

12. Present Appointment and Office Address :

13. Research Activities & Publications : (ENCLOSE LIST)

14. Any other Relevant Information :

15. Proposed and Seconded by :

	Name	NCCP(I) Fellowship/ Membership No.	Address	Signature
Proposer :				
Seconder :				

16. Signature of Candidate (Applicant) :

Remarks of Credential Committee :

President NCCP(I) …… **Secretary NCCP(I)** ……

National College Of Chest Physicians (India)

(Formerly Indian Association for Chest Diseases)

V. P. Chest Institute, University of Delhi, Delhi - 110007

Ref No: NCCP (I) Secy./Directory/ Dated : ……..

Regd No.:S/1421 (1981)

NCCP (I) DIRECTORY ENTRY FORM

Instructions :

1. Please use Capital Letters or Type.
2. Please mention your Membership / Fellowship number for all future correspondence with College.
3. All correspondence and the IJCDAS (Journal) will be dispatched at your Mailing address.
4. Filled applications to be sent to **Prof. S. N.Gaur, GAUR Clinic, 130-A, Patparganj Village, Delhi – 110091.**

Membership/ Fellowship No.											**MembershipYear**				**FellowshipYear**				

(Leave blank if submitted along with application for new membership)

Surname	
First Name	
Middle Name	

Date of Birth:								
	D	**D**	**M**	**M**	**Y**	**Y**	**Y**	**Y**

Present Designation & Organisation:	

Permanent Address:			
		City	
State			**PIN**

Mailing Address*:			
		City	
State			**PIN**

Telephone / Fax (with Area Code)

Residence:		**Office:**	
Fax:		**Mobile:**	

E-mail Address:	

Degrees:	

Affiliation to other Scientific Bodies:		

Specialties:	1.		2.	
	3.		4.	

Interest Section:	

Spouse Name:	
Spouse Profession:	

* Please let us know about any other information / suggestion or out of date information printed in the last Directory.

** Enclose any other information to be added in the Directory on a separate sheet.

NATIONAL COLLEGE OF CHEST PHYSICIANS (INDIA)
GOVERNING COUNCIL 2020-2021 (W.E.F. 01-04-2020)

Dr. P. D. Motiani
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President-Elect (2021-22)

Dr. Surya Kant
Immediate Past President (2019-20)

Lt. Gen. Dr. B.N.B.M. Prasad
Vice-President (2020-22)

Dr. S. N. Gaur
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Organizing Chairman, NAPCON 2020

Dr. Raj Bhagat
Joint Secretary (2020-22)

Dr. V. K. Singh
Treasurer (2018-21)

Dr. Raj Kumar
Editor, IJCDAS (Director, VPCI)

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Dr. R. Narasimhan
Zonal Chairman (South)

Dr. Narayan Mishra
Zonal Chairman (East)

Dr. V. K. Jain
Zonal Chairman (West)

Dr. S. K. Katiyar
Zonal Chairman (Central)

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Dr. Ramakant Dixit
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Councillor (2019-21)

Dr. K. B. Gupta
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Dr. Rajendra Prasad
Councillor (2020-22)

Dr. Gajendra Vikram Singh
Councillor (2020-22)

Dr. Nikhil Sarangdhar
Organizing Secretary, NAPCON 2020

Dr. S. K. Katiyar
Chairman, Academic Forum

Dr. Rajesh N. Solanki
Member, Academic Forum

Dr. Rajesh Chawla
Member, Academic Forum

Dr. K. B. Gupta
Member, Academic Forum

National College of Chest Physicians (India)

Congratulates

Former President, NCCP(I) [2010-2011]

Prof. Dr. D. Behera

on being conferred the prestigious title of

'Padma Shri' by the Government of India in 2020

Padma Shri Prof. Dr. D. Behera

[M.D.(Med.), FCCP, FAMS, FNCCP(I), FICP, FICA, FAPSR, FICS, MNAMS (Med.), Dip.NBE (Respiratory Med.)]

OSD, AIIMS, Rae Bareli
Chairman, National Task Force (NTEP)
Senior Professor and Former Head of Department of Pulmonary Medicine, Former Dean (Research) and Former Chairman of Medical Departments (Group B), PGIMER, Chandigarh

Born in 1953, Prof. Dr. D. Behera is a native of Orissa. Prof. Behera was educated in Cuttack and completed his graduation from SCB medical college, Cuttack (Utkal University) in 1978. He joined the PGIMER as a Junior Resident in the department of Medicine in 1978 and has continued in various capacities till date. He completed his MD (Medicine) in 1980 and Diplomate of National Board of Examinations in Medicine and Respiratory Medicine in 1982 and 1983 respectively. He joined the Pulmonary Medicine department faculty in 1984 and was elevated to the Chair of Professor in 2000. He became Senior Professor and Head of the Department in 2014. He also served on deputation as Director of National institute of Tuberculosis and Respiratory Diseases (formerly L.R.S. institute), New Delhi from 2006-2012. Prof. Behera is a Member and Fellow of several national and international professional associations in Pulmonary Medicine. Prof. Behera is particularly interested in Lung Cancer. He is recognized globally as a pioneer of lung cancer chemotherapy in India, and is the Founder President of the Indian Society for the Study of Lung Cancer. He has guided over post graduate and postdoctoral theses and is associated with several other associations across the country as Member, Fellow or President, namely the National College of Chest Physicians (India) (2010-2011) the Tuberculosis Association of India (2011), and the Asian Chapter of International Union against Tuberculosis & Lung disease (IUAT-LD). He is also the President-Elect of the Indian Chest Society (2020-2021).

Prof. Behera has published over 550 papers and has delivered more than 1000 presentations and guest lectures at several national and international conferences. He has authored 9 books on Pulmonary Medicine, including Text Book of Pulmonary Medicine and Chief Editor of the NCCP (I) Textbook of Respiratory Medicine and has served as Editor of the Indian Journal of Tuberculosis and a Member of the Editorial Board of Indian Journal of Chest Diseases and Allied Sciences and Lung India, apart from several other prestigious peer-reviewed indexed journals. He is also a Member of the Education Committees of the International Society for Study of Lung Cancer and the Indian Society of Oncology and of the Scientific Committee, Asia Pacific Society of Lung Cancer. He was the Vice-Chairman and Chairman of the TB section of the Union and was in its Executive Committee as a member. He is also a member of the Executive Committee of the National Academy of Medical sciences. Prof. Behera is the Chairman of the National Task Force for Medical College involvement in NTEP (formerly RNTCP) and was the Chairman of the National Operational Research Committee (OR) of the NTEP for many years. He is chairman of various sections of TB Research Consortium of the ICMR. He is also chairing the Vaccine Trial of TB in India under the ICMR.
Apart from the prestigious Padma Shri, Prof. Behera has been awarded several awards in recognition of his pioneering research and contributions towards Respiratory Diseases

INTERNATIONAL	NATIONAL
1. The Karel Styblo Prize for Public Health –by the Union (IUATLD) for contribution in the field of tuberculosis (2009) 2. Developing Nations Investigators Award by the International Association for the Study of Lung Cancer (2000, 2003, 2005 & 2007) 3. International Cancer Research Exchange Technology Transfer (ICRETT) Award by the International Union Against Cancer (UICC), Geneva (1996) 4. John F. Perkins Memorial Award by the American Physiology Society (1991) 5. Fogarty International Fellowship Award by the National institute of Health (NIH), USA (1990-1992) 6. IUATLD Prize by the International Union Against Tuberculosis and Lung Diseases for Scientific Contribution to the Fight against Respiratory Diseases (1990) 7. Cancer Research Fellowship Award (ICRETT) by the International Union against Cancer (UICC), Geneva (1989)	1. Dr. Dheeraj Gupta Memorial Oration by the Academy of Pulmonary Sciences (2019) 2. Biju Patnaik Award for Scientific Excellence, Odisha Bigyan Academy (2016) 3. Dr V.K. Vijayan Oration Award, V.P. Chest Institute, University of Delhi (2016) 4. Robert Koch Oration by Indian Army Group of Hospitals (Research & Referral), New Delhi (2016) 5. Dr. P.R.J. Gangadharam Endowment Oration Award by MGIMS (2015, delivered in 2016) 6. Academy of Respiratory Medicine - Prof. Dr. P. S. Shankar Oration (2014) 7. National College of Chest Physicians (India) - Prof. Raman Viswanathan Memorial Oration (2013) 8. Dr. P.K. Sen TAI Gold Medal Oration by the Tuberculosis Association of India (2011) 9. Achanta Lakshmipathi Oration Award by the National Academy of Medical Sciences, India (for 2010-2011) 10. Dr. Rajender Prasad Memorial Oration, C.S.M.U, Lucknow (2011) 11. Dr. G.D. Sharma Memorial Oration award by SMS Medical College, Jaipur (2010) 12. Indian Chest Society Oration Award (2009) 13. Tandon Mathur Oration, Dept. of Pulmonary Medicine, King Georges Medical University, Lucknow (2007) 14. Amrut Mody Unichem Award (Chest Diseases) by the Indian Council of Medical Research (ICMR) in recognition of significant contributions in biomedical research (2006) 15. Dr. Reddy's Oration by the Indian Society for Study of Lung Cancer (2005) 16. Dr. B.C. Roy Award in the category of Eminent Medical Teacher by Medical Council of India (2004) 17. Bijoy Govinda Award by Bijoy Govinda Memorial Charitable Trust, Cuttack, Orissa (2002) 18. Dr. Krishna Singla Memorial Oration, Himachal Pradesh Association of Physicians of India Chapter (2002) 19. National College of Chest Physicians (India) - Cipla Chest Oration (2001) 20. Hari Om Ashram Alembic Research Award by the Medical Council of India (2000) 21. Devi Chand Memorial Oration Award by I.G. Medical College, Shimla, Govt. of Himachal Pradesh (2000) 22. Prof. Rathinavelu Subramaniam Edowment Oration 2000 by the Association of Physicians of India (1999) 23. Samanta Chandra Sekhar Award by Orissa Bigyan Academy (1998) 24. Charu Chandra Das Memorial Award by Tuberculosis Association of India (1997) 25. Coehlo Memorial Research Lectureship Award on Experimental Medicine by the Association of Physicians of India (1993) 26. Smt. Kamal Satbir Award by the Indian Council of Medical Research (1992) 27. Shree Krishnaji Govind and Mrs. Pramilabai Bhate Memorial Lecture Award on Asthma and Bronchitis by the Association of Physicians of India (1989) 28. ICMR Award by the Indian Council of Medical Research for Research in the Field of Respiratory Physiology of Smoking (1985)

National College of Chest Physicians (India)

Congratulates

Former President, NCCP(I) [2003-2004]

Prof. Dr. S. K. Katiyar

on being conferred

Dainik Jagran 'Ayushman India'
Lifetime Achievement Award
and
The Economic Times
'Inspiring Pulmonologists of India' Award

Dr. S. K. Katiyar

[M.D. , D.T.C.D., F.N.C.C.P(I), F.I.C.S., F.I.C.A.A.I.]

- Consultant , Chest Care centre & Apollo-Spectra hospital, Kanpur
- Chairman, Scientific Committee, NAPCON-2020, 2018, 2016 & 2014
- Chairman, Central Zone, National College of Chest Physicians (India)
- Chairman, Academic Forum, National College of Chest Physicians (India)
- Former Principal & Dean, Professor & Head, Dept. of Tuberculosis & Respiratory Diseases, GSVM Medical College & CSJM University, Kanpur
- President, National College of Chest Physicians (India) [2003-2004], Tuberculosis Association of India [2007-2008], Indian Chest Society [2009-2010], U.P. TB Association [1996-1997]
- Organizing Secretary, NAPCON-2000
- Eminent Orator with more than 350 guest lectures at several national and international conferences
- Prolific Writer with more than 100 publications
- Examiner in M.D. & D.T.C.D. and Supervisor / Co-supervisor in over 125 Theses of M.D. in various disciplines of Medicine
- Recipient of Several Awards :

1. National College of Chest Physicians (India) - Prof. M. M. Singh Lifetime Achievement Award (2018)
2. Environmental Medical Association - Emeritus DIR. Prof. Dr. K. C. Mohanty Oration (2017)
3. Prof. Raman Viswanathan - VPCI Oration at V.P. Chest Institute, Delhi (2017)
4. Tuberculosis Association of India - Dr. P. K. Sen Gold Medal Oration Award (2016)
5. National College of Chest Physicians (India) - Prof. Raman Viswanathan Memorial Chest Oration (2015)
6. Indian College of Allergy , Asthma & Applied Immunology - Dr. D. N. Shivpuri Oration (2013)
7. Indian Chest Society - Dr. S. N. Tripathy Presidential Oration Award (2011)
8. Dr. V. N. Mishra Oration of Allahabad Medical Association (2006)
9. Keynote Address at International Conference on Functional Genomics for Novel Vaccine & Drug Design against Mycobacterial Infections (2005)
10. Pandit P.K. Shankhdhar Memorial Oration on World Tobacco Day (2003)
11. National Science Day Oration of Indian Toxicology research centre (2002)
12. National College of Chest Physicians (India) - Cipla Chest Oration (1999)
13. Tuberculosis Association of India - Robert Koch Oration

National College of Chest Physicians (India)

Congratulates

Prof. Dr. Surender Kashyap

on being appointed

Vice-Chancellor,
Atal Medical & Research University, Mandi,
Himachal Pradesh (A State University)

Dr. Surender Kashyap

[M.D.(Med., PGIMER); D.N.B.(Resp. Dis.)]

- Former Director, Kalpana Chawla Government medical college, Karnal, Haryana
- Former Dean & Head, Department of Pulmonary medicine, Indira Gandhi medical college, Shimla
- Former Elected Member, Medical Council of India
- Fellow of College of Chest Physicians, National College of Chest Physicians (India), Indian Chest Society
- Published more than 100 scientific papers
- Reviewer for Thorax, European Journal of Clinical Microbiology & Infectious Diseases, Thoracic Cancer, Annals of Thoracic medicine, Indian Journal of Chest Diseases & Allied Sciences, Indian Pediatrics and IAPI
- Recipient of Several Awards :

1. Unnat Bharat Sewa Shree Health Rattan by Unnat Bharat Sangthan Trust (2019)
2. National College of Chest Physicians (India) - Lupin Chest Oration (2013)
3. Charu Castle Foundation Dev Bhumi Award for outstanding contribution in Medicine & Social Work (2011)
4. Prime Minister's Award for excellence in Public Administration (2010)
5. Best Educationist Award of International Institute of Education & Management (2009)
6. Vidya Rattan Gold Medal Award of Indian Solidarity Council (2009)
7. International Union against Cancer (UICC) Fellowship under International Technology Transfer at Beth Israel Deaconnes Medical Centre, Boston (2004)
8. Association of Physicians of India - Shree Krishnaji Govind and Mrs. Pramilabai Bhate Memorial Lectureship in Asthma and Bronchitis (1993)
9. International Technology Transfer fellowship for Thoracic Oncology at H. Lee Moffitt Cancer and Research Institute, University of South Florida (1988)

COMPREHENSIVE
Pulmonary Medicine eCourse

Dr. Rajesh Chawla
NCCP(I) E- Course Director

COURSE HIGHLIGHTS

- CPMeC has been meticulously prepared by National College of Chest Physicians (India) with the help of Eminent National and International Pulmonology Experts
- CPMeC is useful for Students as well as Practising Pulmonologists for updating themselves with latest recommendations and standards of care for the management of various respiratory diseases
- CPMeC consists of 50 online modules to cover all aspects of Pulmonary Medicine over a span of 150 days
- Each module contains Master Class, Take Home Points, Suggested Reading and Feedback
- More than 1400 Doctors have successfully enrolled in CPMeC accredited by National Board of Examinations, New Delhi (II-A)
- NCCP (I) E-Courses will issue online certificate after successful completion of the course

Website - https://chestcourses.org Support - https://support.chestcourses.org , +91 - 84540 94444

Course Fee : NCCP(I) Members - 4000 INR ; Non-NCCP(I) Members - 6000 INR ; Foreign Nationals - 149 USD

Interventional
Pulmonology
E-course

Dr. Rajesh Chawla
NCCP(I) E- Course Director

COURSE HIGHLIGHTS

- Nowadays, Interventional Pulmonology has progressed from simple Bronchoscopy to highly advanced diagnostic and therapeutic Bronchoscopy and Thoracoscopic procedures
- IPeC has been meticulously prepared by National College of Chest Physicians (India) with the help of Eminent National and International Experts in International Pulmonology
- IPeC is useful for Students as well as Practising Pulmonologists for to acquaint and update themselves with the skills required to perform a variety of diagnostic and therapeutic procedures including Bronchoscopy, Endobronchial Ultrasound (EBUS), Medical Thoracoscopy, Cryobiopsy, Airway Stenting , Management of Air Leaks and Hemoptysis and Percutaneous Tracheostomy
- IPeC consists of 30 online modules to cover all aspects of Interventional Pulmonology over a span of 180 days
- Each module contains Master Class, Take Home Points, Suggested Reading and Feedback
- NCCP (I) E-Courses will issue online certificate after successful completion of the course

Website - https://chestcourses.org Support - https://support.chestcourses.org , +91 - 84540 94444

Course Fee : NCCP(I) Members - 4100 INR ; Non-NCCP(I) Members - 6100 INR ; Foreign Nationals - 137 USD

INDIAN GUIDELINES ON NEBULIZATION THERAPY

an initiative of

NATIONAL COLLEGE OF CHEST PHYSICIANS (INDIA)

Dr. Rajesh Solanki
President, NCCP(I) [2018-19]

Dr. S. N. Gaur
Secretary, NCCP(I)

Dr. S. K. Katiyar
Chairman & Convenor

Dr. Nikhil Sarangdhar
Coordinator

Dear Colleagues,

You will be happy to know that we are soon going to publish 'Indian Guidelines on Nebulization Therapy' under the aegis of the National College of Chest Physicians (India). These guidelines are the first of their kind in our country and their compilation a pioneering achievement by the College in the field of Medical Education.

To formulate, compile and publish the Indian Guidelines on Nebulization Therapy under the aegis of the National College of Chest Physicians (India) was the brainchild of Prof. Dr. S. K. Katiyar. The Meeting of Experts for the Indian Guidelines on Nebulization Therapy was convened at Delhi on 3rd and 4th November 2018. A total of 67 Experts in Pulmonary Medicine across India, including members from states like Jammu & Kashmir and Assam were invited to ensure unique pan-Indian representation of ideas, expertise and opinion. Dr. S. K. Katiyar planned and convened the meeting, which was chaired by Dr. Rajesh Solanki [President, NCCP(I), in chair] and Dr. S. N. Gaur [Secretary, NCCP(I), in chair] and coordinated by Dr. Nikhil Sarangdhar.

The expert members were allocated into five groups consisting of a Group Convenor, Chairpersons, Advisor and Expert Members to cover different aspects of Nebulization therapy as follows :

1. Group A - Introduction, basic principles and technical aspects of nebulizers, types of equipment, their choice and maintenance.
2. Group B - Nebulization therapy in obstructive airway diseases
3. Group C - Nebulization therapy in the intensive care unit
4. Group D - Use of various drugs (other than bronchodilators & inhaled corticosteroids) by nebulized route and miscellaneous uses of nebulization therapy
5. Group E - Domiciliary nebulization therapy, public and healthcare workers education and future research
   Five groups were constituted originally, but looking at the present global crisis created due to the pandemic of COVID-19 and consequently the apprehensions and concerns raised by spread of infection through nebulization it was thought to include a sixth group in the expert panel to provide guidance to caregivers while nebulizing patients, as follows :
6. Group F - Nebulization Therapy during COVID-19 pandemic and in patients of other contagious viral respiratory infections

Each group discussed the review of scientific evidence by members with intra-group discussions. Evidence and recommendations were presented by individual groups in the final meeting, for deliberations on the recommendations and arrival of consensus. After the meeting concluded, the drafts were compiled subsequently groupwise and sent to the Convenor for editing . The edited and refined versions of each group draft was circulated to group members for their final comments prior to publication.

The final document of the Indian Guidelines on Nebulization Therapy under the aegis of NCCP(I) consists of six group drafts compiled after systematic review of evidence in order to cover each and every aspect of Nebulization therapy. The guideline document is meticulously compiled and edited with text, level of evidence and grade of recommendation, abbreviations and references.

It gives us immense pleasure to announce to this effect that the compilation of the Indian Guidelines on Nebulization Therapy under the aegis of NCCP(I) is complete and its publication is under progress. We are sure it will be immensely useful as a source of academic knowledge as well as a reference guide for practitioners, teachers, post-graduate medical students, researchers and healthcare workers in the field of Respiratory Medicine, Internal Medicine and other allied sciences which everyone would like to keep ready on their desk.

INDIAN GUIDELINES ON NEBULIZATION THERAPY

an initiative of

NATIONAL COLLEGE OF CHEST PHYSICIANS (INDIA)

ORGANIZERS

President : Dr. Rajesh Solanki | **Secretary : Dr. S. N. Gaur**

Convenor & Chairman : Dr. S. K. Katiyar | **Coordinator : Dr. Nikhil Sarangdhar**

PARTICIPANTS

Group Convenors

Dr. J. C. Suri, Dr. Raj Kumar, Dr. G. C. Khilnani, Dr. Dhruva Chaudhry, Dr. Rupak Singla, Dr. Parvaiz Koul

Group Advisors

Dr. Dhiman Ganguly, Dr. V. K. Vijayan, Dr. Randeep Guleria, Dr. V. K. Arora

Dr. H. Paramesh, Dr. S. K. Jindal, Dr. P. S. Shankar

Group Chairpersons

Dr. S. N. Gaur, Dr. D. Behera, Dr. Rajesh Chawla, Dr. Deepak Talwar, Dr. A. G. Ghoshal, Dr. P. D. Motiani

Dr. D. J. Christopher, Dr. S. K. Luhadia, Dr. Mohan Kumar T, Dr. K. B. Gupta, Dr. Rajesh Solanki, Dr. A. Mahashur

Group Members

Dr. C. Ravindran	Dr. Narayan Mishra	Dr. R. Narasimhan	Dr. Rajendra Prasad	Dr. J. K. Samaria
Dr. D. Bhattacharya	Dr. Virendra Singh	Dr. N. T. Awad	Dr. Jogesh Sarma	Dr. Surya Kant
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Dr. Anand Jaiswal	Dr. A. K. Janmeja	Dr. Rakesh Chawla	Dr. Mansi Gupta	Dr. Vishal Chopra
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Dr. Viswesvaran B	Dr. Mahendra Kumar	Dr. Pavan Tiwari	Dr. Inderpaul Singh	Dr. Subhadeep Saha

GROUP PHOTOGRAPHS OF NCCP(I) – INDIAN GUIDELINES ON NEBULIZATION THERAPY

NCCP(I) TEXTBOOK OF RESPIRATORY MEDICINE

an educational initiative of

NATIONAL COLLEGE OF CHEST PHYSICIANS (INDIA)

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Editor-in-Chief

Dr. S. N. Gaur
Associate Editor

Dr. S. K. Katiyar
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Dr. S. K. Luhadia
Associate Editor

Dr. K. B. Gupta
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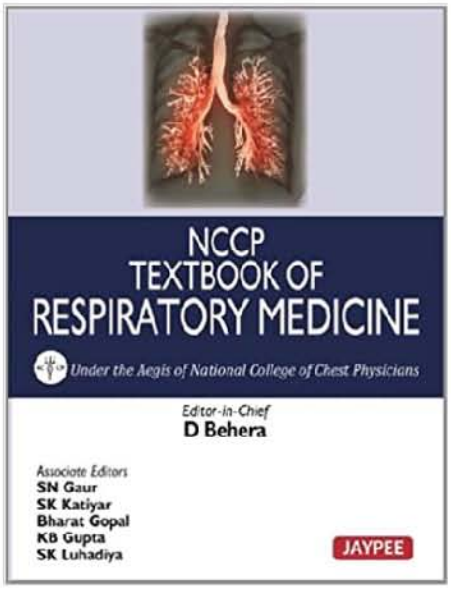

National College of Chest Physicians (India) published Textbook of Respiratory Medicine as part of its continuing educational activities. NCCP(I) Textbook of Respiratory Medicine has been edited by Prof. Dr. D. Behera who has been assisted by five associate editors Prof. Dr. S. N. Gaur, Prof. Dr. S. K. Katiyar, Prof. Dr. S. K. Luhadia, Prof. Dr. K. B. Gupta and Dr. Bharat Gopal. This multi-authored textbook contains 41 chapters contributed by senior and experienced authors, both from India and abroad which have been compiled in a single volume so as to provide comprehensive yet concise information on the ever expanding field of respiratory medicine, with special emphasis on the respiratory disorders prevalent in our country. The objective of this book is to address the needs of a diverse audience and become a par- excellent source of information and references for the post-graduate as well as undergraduate medical students as well as serve as a guide to busy practitioners for management of common respiratory illnesses.

NCCP(I) Textbook of Respiratory Medicine begins with an overall review of the respiratory system, including clinical examination, respiratory symptomatology and physiology, followed by a wide array of chapters on diverse topics, taking care to cover all respiratory diseases common to our country. The text is well referenced and lucid in style for better language flow and adequately supplemented by tables, figures and diagrams. Respiratory disorders have been covered according to their prevalence in our country and relevance in clinical practice. Chapters have been well compiled and edited in order to provide updated and relevant information, keeping in mind that the textbook is meant for a diverse readership comprising of post-graduate, undergraduate and post-doctoral medical students of Respiratory and Internal Medicine as well as practicing Chest Physicians. Overall the textbook is well illustrated and informative, a much sought-after valuable addition to the libraries of medical colleges and teaching institutions and has evolved into a highly popular publication as it highlights the current status and updates on various respiratory diseases and their diagnosis and management.

TEXTBOOK CHAPTERS

1. Physical Examination of Respiratory System
2. Common Clinical Symptoms
3. Growth, Development and Morphology of the Respiratory System
4. Normal Respiratory Physiology
5. Defense Mechanisms of the Respiratory System
6. Diagnostic Methods in Respiratory System
7. Interventional Pulmonology & Electromagnetic Navigation
8. Antimicrobials in Respiratory Medicine
9. Pneumonias
10. Anaerobic Pleuro-pulmonary Infections
11. Parasitic Lung Diseases
12. Tropical Pulmonary Eosinophilia
13. Lung Abscess
14. Bronchiectasis
15. Tuberculosis
16. Non-tubercular Mycobacterial Diseases
17. Bronchial Asthma
18 A. Chronic Obstructive Pulmonary Disease
18 B. Rehabilitation in Chronic Obstructive Pulmonary Disease
19. Aerosol Therapy
20. Respiratory Failure
21. Cor Pulmonale
22. Oxygen Therapy
23. Pulmonary Embolism
24. Acute Respiratory Distress Syndrome
25. Lung Cancer
26. Pulmonary Neoplasms other than Bronchogenic Carcinoma
27. Smoking and Lung Diseases
28. Air Pollution and Respiratory Diseases
29. Essentials of Polysomnography and Recommendations in Adults
30. Sarcoidosis
31. Lungs in Collagen Vascular Diseases and other Systemic Diseases
32. Vasculitis and the Lungs
33. Interstitial Lung Diseases
34. Occupational Lung Diseases
35. Hypersensitivity Pneumonitis
36. Disorders of the Diaphragm and Chest Wall
37. Congenital Anomalies of the Respiratory System
38. HIV and Respiratory Diseases
39. Lung Transplantation
40. Non-invasive Ventilation in Acute Respiratory Failure
41. Pleural Diseases

NATIONAL DIRECTORY OF CHEST PHYSICIANS

an educational initiative of

NATIONAL COLLEGE OF CHEST PHYSICIANS (INDIA)

Prof. Dr. S. N. Gaur
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Organising Chairman, NAPCON 2020
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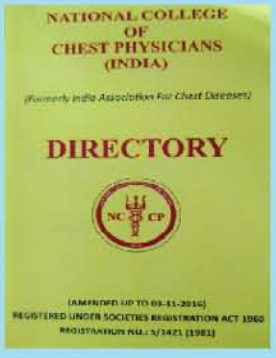

Dear Colleagues,

You are very well aware that National College of Chest Physicians (India) publishes a National Directory of Chest Physicians in India every five years, with the objective of providing contact details of all Chest Physicians across the country. The last NCCP(I) Directory was published in 2016. We thank all members and fellows of NCCP(I) and request You to inform us in case of any change of residential, official or postal address, mobile number and E-mail ID in order for us to prepare the forthcoming Directory, for which You can fill up the Directory Entry Form in this Newsletter and send by post to the NCCP(I) secretariat address below (or download from our website **www.nccpindia.org** and send by E-mail to **sngaur9@gmail.com**).

We also welcome all to submit their plans for events and activities for the forthcoming year. In addition, we would like to ensure You are aware of all your NCCP(I) membership benefits , which include :

- Electronic Voting for Yearly Elections to NCCP(I) Governing Council through E-voting form sent to Your E-mail ID
- Subscription to Indian Journal of Chest Diseases and Allied Sciences (Quarterly issues)
- NCCP(I) National Directory of Chest Physicians (Every 5 years)
- Discounts in Registration for NCCP(I) E-Courses (CPMeC & IPeC)
- Discounts in Registration for participating at National Conferences (including NAPCON), International Conferences (Gulf-Thoracic and others), State Conferences and Workshops and other educational activities under the aegis of NCCP(I)
- Travel Grants for National & International Conferences
- Communications through E-mail and Invitation to attend NCCP(I) Annual General Body Meeting
- Access to NCCP(I) Newsletter – Lung Bulletin (Biennial issues starting from this year)

Should You need any assistance or have any queries regarding Your NCCP(I) Membership or Benefits, please feel free to contact us, our support is always available to help You.

COMMUNICATE WITH US

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TEXTBOOK OF EMERGENCIES IN RESPIRATORY MEDICINE

an educational initiative of

NATIONAL COLLEGE OF CHEST PHYSICIANS (INDIA)

Prof. Dr. Narayan Mishra
Editor- in-Chief, NCCP(I) Textbook of Emergencies in Respiratory Medicine
Zonal Chairman (East Zone), National College of Chest Physicians (India)
Former Professor & Head, Dept. of Pulmonary Medicine, MKCG medical college, Berhampur
Former President, National College of Chest Physicians(India) (2015-16) & Indian Chest Society (2011-12)

Dear Colleagues,

You will be happy to know that we are going to bring out soon a textbook on 'Emergencies in Respiratory Medicine' under the aegis of the National College of Chest Physicians (India) which will be published by Jaypee Brothers. This book is the first of its kind and an excellent step taken by the College in the field of Medical Education. It contains several chapters written by pioneering experts in the field of Respira tory Medicine of our vast country. An attempt has been made to cover each and every aspect of Respiratory Emergencies. Each chapter is meticulously written and edited with abstract, key words, introduction and description of the topic including information on diseases and conditions along with references. It's our immense pleasure to announce to this effect the work of compilation is under progress. We are sure it will be immensely useful as a source of academic and clinical knowledge for practitioners, teachers, post-graduate medical students and researchers in the field of Respiratory Medicine and other allied sciences which everyone would like to keep ready and have with them.

NATIONAL COLLEGE OF CHEST PHYSICIANS (INDIA)

announces

MAHARASHTRA STATE CHAPTER

Dear Colleagues,

It gives us great pleasure to inform You that NCCP(I) has started Maharashtra state chapter, to promote and strengthen the objectives of NCCP(I) at regional level. We thank all members and fellows of NCCP(I) and eagerly look forward to have them on board to involve them. We welcome all to submit your plans for academic events and activities over the next couple of years. In addition, we want to make sure You are taking full advantage of all the NCCP(I) membership benefits available. One of our priorities to get started will be to enrol more members to pass on NCCP(I) membership benefits including :

- Access to Members-only Content
- Networking Opportunities
- Professional Development Opportunities
- Access to Indian Journal of Chest Diseases and Allied Sciences
- Access to NCCP(I) Newsletter
- Discounts for participating at National Conferences (including NAPCON), State Conferences and Workshops

Should you need any assistance or have any questions or comments about your membership or benefits, please feel free to contact us. We look forward to Welcoming and Greeting You at Our next meeting !

Dr. B. O. Tayade
Prof. & Head, Dept. of Pulmonary Medicine
NKP Salve institute of Med. Sciences, Nagpur
President, Maharashtra State Chapter
President-Elect, NCCP(I) (2021-22)
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Dr. Sushant Meshram
Prof. & Head, Dept. of Pulmonary Medicine
Government Medical College, Nagpur
Secretary, Maharashtra State Chapter
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PULMONARY & SLEEP MEET 2020

To mark the silver jubilee occasion of M.D. (Pulmonary Medicine) course at the Government Medical College, Nagpur completing 25 years since inception, the department organised a national conference 'Pulmo and Sleep Meet' on 7th and 8th March 2020, in association with World Sleep Society, National College of Chest Physicians (India), Pulmo Alumni Association, Association of Physicians of India, Indian Chest Society, Vidharbha Chest Association, Indian Medical Association and Sleep Apnea Association of India.

The conference was organised at Government medical college, Nagpur. Dr. Sushant Meshram, Professor and Head, Department of Pulmonary, Critical Care and Sleep Medicine, Government medical college, Nagpur was the Organising Chairman and Dr. Vivek Gupta, Consultant Pulmonologist, Nagpur was the Organising Secretary. Pulmo and Sleep Meet conference was inaugurated at the hands of Dr. Sanjay Mukherjee, IAS, Secretary, Medical Education and Drugs department, Govt. of Maharashtra, in the presence of Dr. Dilip Mhaisekar, Vice-Chancellor, Maharashtra University of Health Sciences, Dr. Sajal Mitra, Dean, Government medical college, Nagpur and Dr. Ajay Keoliya, Dean, Indira Gandhi Government medical college, Nagpur. Prominent dignitaries graced the occasion; namely Dr. Nancy Collop, former President, American Academy of Sleep Medicine, Dr. Sunil Khaparde, former Deputy Director Health Services (TB), Government of India, Dr. B. G. Waghmare, former Joint Director Medical Education, Maharashtra, Dr. B. R. Maldhure, former Head of department, Dr. B. O. Tayade, President-Elect, NCCP(I) and former Head of department, Dr. Ravindra Sarnaik, Chairman, NCCP(I) Maharashtra state chapter, Dr. Rajesh Swarnakar, Secretary, ICS, Dr. Radha Munje and others.

The scientific programme comprised of several current burning topics which were deliberated upon by international and national faculty. Dr Priya Ramachandran spoke on lung ultrasound, Dr. Harish Chafle on Pulmonolgists in ICU, Dr. Sushant Meshram on Biologics in severe asthma, Dr. S. Yuvarajan on basic and advanced pleural interventions and Dr. Satish Agrawal on paediatric TB. Panel discussions on Tuberculosis and Lung Cancer were moderated by Dr. Radha Munje and Dr. Rajesh Swarnakar respectively. Dr B.R. Maldhure taught the basics of Chest X-Ray interpretation to PG students. Symposium on lung transplantation was managed by Dr. Apar Jindal, Dr. Vivek Gupta and Dr. Nikunj Pawar. The Sleep Symposium included lectures on obstructive and central sleep apnea by Dr. Nancy Collop, positive airway pressure therapy by Dr. Abdul Majid Arshad, surgical mandibular advancements by Dr.Wasundhara Bhad and the future of sleep medicine by Dr. Sushant Meshram.

On this occasion a public forum was also organised on "Sleep - A Master Key for healthy life" which was attended by 600 people. The Pulmo & Sleep Meet was accredited with 4 credit hours by the Maharashtra medical council and well attended by 411 delegates of different specialities, i.e. Pulmonologists, Neurologists, Psychiatrists, Physicians, Cardiologists, Anaesthesiologists, ENT specialists, paediatricians and surgeons across the country.

NATIONAL COLLEGE OF CHEST PHYSICIANS (INDIA)
TRAVEL GRANT FOR CONFERENCES

- The American Thoracic Society (ATS) and American College of Chest Physicians (ACCP) have agreed to the nomination of 2 delegates as representatives of the National College of Chest Physicians (India) to attend and participate in their annual conferences. These NCCP(I) nominees (Fellows only) will be provided complimentary registration and local accommodation by the Organizers. Travel has to be arranged by the nominees themselves.

- In addition, NCCP(I) is providing travel grant worth a fixed amount to its Members and Fellows for participation in national* and international conferences* as follows :
  - Rs. 20,000/- for national conferences in India*
  - Rs. 80,000/- for international conferences in U.S. & Canada
  - Rs. 60,000/- for international conferences in other countries

- Those NCCP(I) Fellows or Members interested, can apply to Hon. Secretary, NCCP(I), preferably before March each year (as ATS conference is usually held in May and ACCP annual meeting in October of the calendar year) for consideration providing details on a request letter as follows :

CHECK-LIST

1. Name, Dates and Venue of conference ☒
2. Details of Participation in the concerned conference (Delegate/Faculty) ☒
3. Letter of Abstract Acceptance or Invitation at the concerned conference ☒
4. Applicant Particulars ☒
   (Full name, age in years, gender, Postal address, E-mail ID & Mobile number for communication)
5. Present designation/affiliation ☒
6. NCCP(I) Life Fellowship (LF) or Life Membership (LM) number ☒
7. Number of NAPCONs attended in last 5 years ☒
8. Number of total conferences (national + international) attended in last 5 years ☒
9. Number of publications in last 5 years (attach list) ☒
10. Forwarding letter preferably signed by Head of Department or Institution or a Fellow of NCCP(I) ☒
11. Hard copies of receipts for reimbursement (Registration, Travel, Stay) with breakup of expenses ☒
12. Disclaimer or statement whether availing travel grant/other monetary assistance from any other source for the same ☒

- The grant applications should be sent by post addressed to Hon. Secretary, NCCP(I) at the following address :
  Dr. S. N. Gaur , Gaur Clinic, 130- A, Patparganj Village, Delhi – 110091. Phone : +91- 9811271916
  E-mail : sngaur9@gmail.com

- All applicant requests will be scrutinized by a Credential committee at NCCP(I) Governing Council meeting, for those selected, expenses as per norms will be reimbursed by postal cheque in the name of the applicant only.

- **NCCP(I) – Prof. S. N. Gaur Young Scientist Award at NAPCON***
  - The applicant should not be more than 35 years of age and should be the first author of the abstract submitted for oral presentation at NAPCON mentioning selection for NCCP(I) – Prof. S. N. Gaur Young Scientist award.
  - All abstracts forwarded by the NAPCON for NCCP(I) – Prof. S. N. Gaur Young Scientist Award will be scrutinized by an Academic Committee specially constituted by NCCP(I) for this purpose . A maximum of 9 abstracts will be selected for presentation in this award session and the presenters informed accordingly prior to the conference.
  - All selected presenters will receive Rs. 5000/- as travel grant by cheque and a certificate of presentation, in addition to certificates and award adjudged for the First, Second and Third prizes.

For NAPCON, NCCP(I) - Prof. Dr. S. N. Gaur Young Scientist Award is available for Young Scientists.
NAPCON Registration is Discounted for All Life Members and Fellows of NCCP(I) and ICS.

POST-GRADUATE QUIZ IN RESPIRATORY DISEASES

an academic initiative of

NATIONAL COLLEGE OF CHEST PHYSICIANS (INDIA)

For all medical students, continuing medical education (CME) programmes, seminars, updates, workshops and conferences form an integral part of their training apart from the bedside clinical teaching, ward rounds and lectures imparted at medical colleges or teaching institutions. Quiz competition comes as a refreshing change from all these academic activities to enhance and fine-tune their learning and it is something they look forward to with excitement and enthusiasm. To encourage and recognize the budding potential in our Chest Physicians of tomorrow, National College of Chest Physicians (India) undertook the initiative to conduct Post-graduate Quiz Competition in Respiratory diseases with the objective to promote scientific temper in PG students of Pulmonary medicine in India, state-wise as well as nationally.

The NCCP(I) State PG quiz in Respiratory diseases was organised in 15 states at medical colleges/teaching institutions, keeping nationally renowned faculty in Pulmonary medicine as state PG quiz anchors. The first two winners in order of merit in each state were awarded NCCP(I) prize certificate and a cash award of Rs. 5000/- each, with a certificate of participation distributed to all participants. The NCCP(I) State PG quiz programme was a grand success, with a record participation of 290 PG students from different states across the country.
To keep up and carry forward this scientific temper, it was necessary to create a national academic platform to acknowledge and reward this young talent identified among PG students of Pulmonology at state level. Keeping this objective in mind, National College of Chest Physicians (India) organised an All-India PG quiz competition in Respiratory diseases for the first time in our country. Members of the winning team (2 students) from each state were provided a scholarship to participate in the All-India PG quiz with arrangements for accomodation and air travel. All 30 students confirmed their participation and attended the NCCP(I) All- India PG quiz .

The NCCP(I) All-India PG quiz was conducted on Saturday, 21st December 2019 during the 74th National Conference of TB & Chest diseases from 5:00 to 7:15 p.m. at Hotel Leela Palace, Chennai . Dr. Vishnu Sharma, Professor & Head, Department of Respiratory medicine, A J institute of medical sciences, Mangalore was invited to be the National Quiz Master. The PG quiz was inaugurated by Dr. S. N. Gaur (Secretary), Dr. S. K. Katiyar (Chairman, Academic Forum) and Dr. Nikhil Sarangdhar (Coordinator) from NCCP(I) who welcomed all PG students and congratulated them for standing first in the PG quiz in their respective states. After wishing all success, the quiz programme was outlined by Dr. Vishnu Sharma. The preliminary round consisted of 42 multiple choice questions (MCQs) given to all participants to be answered within 20 minutes, at the end of which all answer sheets were collected and each question transparently discussed along with the answer by powerpoint presentation through on-screen display. The individual scores of both students in each team in the preliminary round were combined to compute the final score of each team. The team members from Delhi, Tamil Nadu, Karnataka and Kerala scored the highest in the preliminary round and were selected to participate in the grand round on stage with a buzzer in front. Coordination of each team and functioning of audio-visuals were cross-checked twice and verified with each team before the grand round commenced. 9 rounds of question-answer sessions with first-best answer type pattern were conducted, the answers being discussed at the end of each session. A maximum interval of 5 seconds between pressing the buzzer to answering the question by the respective team was permitted. 10 marks were awarded for correct answers, with negative marking of 5 marks for wrong answers to the respective team. The teams from Delhi, Tamil Nadu, Karnataka and Kerala scored 55, 25, 10 and 35 marks respectively and were congratulated for their performance in the grand round.

For the award ceremony Dr. V. K. Arora, Vice-Chairman, TB association of India and Past-President of NCCP(I) was invited to the dias along with Dr. S. N. Gaur, Dr. S. K. Katiyar, Dr. Nikhil Sarangdhar and Dr. Vishnu Sharma. The first prize carried NCCP(I) prize certificate, cheque of Rs. 25000/- each and plaque of "D.B. Gupta budding talent award" and was awarded to Dr. Tanmay Jain and Dr. Arunachalam from Delhi. The second prize carried NCCP(I) prize certificate and cheque of Rs. 15000/- each and was awarded to Dr. Mahroofa EV and Dr. Archana LP from Kerala. The third prize carried NCCP(I) prize certificate and cheque of Rs. 10000/- each and was awarded to Dr. Amal Johnson and Dr. Vaseema Tabassum from Tamil Nadu. All winners and participants were congratulated .

As a token of appreciation, a certificate of participation from NCCP(I) was personally awarded to all 30 PG students, with congratulations for their efforts and best wishes for their future. A special certificate of appreciation was awarded to Dr. Vishnu Sharma on behalf of NCCP(I) for his efforts towards conducting the NCCP(I) All-India PG quiz in a highly transparent and professional manner.

State	PG Quiz Anchor(s)	Venue of State PG Quiz	Winning Team	
			Names	Institute
Delhi	**Dr. Vivek Nangia**	Fortis Hospital, Vasant Kunj, New Delhi	**Dr. Arunachalam** **Dr. Tanmay Jain**	NITRD, Delhi Metro hospital, Noida
Gujarat	**Dr. Savita Jindal** **Dr. Sanjay Tripathi**	LG Hospital, Ahmedabad	**Dr. Palak Bhatt** **Dr. Trupti Gadhavi**	Ahmedabad municipal corporation MET medical college, Ahmedabad
Haryana	**Dr. Dhruva Chaudhry**	PGIMS, Rohtak	**Dr. Sameer Kotalwar** **Dr. Ankit Aggarwal**	Medanta hospital - the medicity, Gurgaon
Himachal Pradesh	**Dr. Malay Sarkar**	Indira Gandhi medical college, Shimla	**Dr. Swadesh Mohanty** **Dr. Aseem Sirkeck**	Indira Gandhi medical college, Shimla
Karnataka	**Dr. Shashi Bhushan**	PMSSY Super Specialty block, Victoria hospital, Bengaluru	**Dr. Rashmitha MT** **Dr. Parvathy Pillai**	Bangalore medical college & research institute, Bengaluru
Kerala	**Dr. Kiran Vishnu Narayan**	Indraprastha hotel, Kottayam	**Dr. Mahroofa EV** **Dr. Archana LP**	Institute of Chest diseases, Government medical college, Kozhikode
Maharashtra	**Dr. Sushant Meshram**	Government medical college, Nagpur	**Dr. Allna Alexander** **Dr. Abhishek Singh**	Government medical college, Nagpur
Odisha	**Dr. Narayan Mishra**	Hotel Spectrum, Berhampur	**Dr. Biswajit Pati** **Dr. Saurabh Gupta**	VIMSAR med. college, Burla KIMS, Bhubaneswar
Puducherry	**Dr. S. Yuvarajan**	SMV medical college & hospital, Puducherry	**Dr. Naren Chandra** **Dr. Selvaraja**	JIPMER, Pondicherry
Punjab	**Dr. Vishal Chopra**	Government medical college, Patiala	**Dr. Leena Chopra** **Dr. Jain Thomas**	Government medical college, Patiala
Tamil Nadu	**Dr. V. Vinod Kumar**	Government hospital of Thoracic Medicine, Tambaram, Chennai	**Dr. Amal Johnson** **Dr. Vaseema Thabassum**	Apollo hospital, Chennai
Telangana	**Dr. Sailaja K** **Dr. R. Vijai Kumar**	Mediciti institute of medical sciences, Hyderabad	**Dr. Lavanya K** **Dr. Govardhan Reddy**	Mediciti institute of medical sciences, Hyderabad
Uttar Pradesh	**Dr. Surya Kant**	King George medical university, Lucknow	**Dr. Shiv Kumar Verma** **Dr. Vignesh K**	King George medical university, Lucknow
Uttarakhand	**Dr. Girish Sindhwani**	AIIMS Rishikesh	**Dr. Kumar Nishant** **Dr. Sandeep Kumar**	Himalayan institute of medical sciences, Dehradun
West Bengal	**Dr. Shelley Shamim**	Calcutta National medical college, Kolkata	**Dr. Riksoam Chatterjee** **Dr. D Suresh Kumar**	SSKM medical college, Kolkata

Report of NCCP(I) State PG Quiz in Respiratory Diseases

Dr. Vishnu Sharma

Quiz Master, NCCP(I) All-India PG Quiz in Respiratory Diseases

Professor & Head, Department of Respiratory medicine, A J institute of Medical Sciences, Mangalore

Quiz is basically a form of mind sport, in which the players (as individuals or in teams) attempt to answer questions correctly. The word "Quiz" may have originated in student slang and it means to "test knowledge". Quiz is used in education to test knowledge, abilities or skills of individuals. I have been conducting quiz for respiratory medicine post-graduate students since the last ten years. Post-graduate quiz during a conference with provision of scholarship to meritorious students always generates a lot of excitement, with all students participating enthusiastically. While compiling quiz questions emphasis is laid on must-know facts for the students. A properly conducted quiz with academic focus helps to enhance post-graduate learning. It was a great honour for me to be invited by the National College of Chest Physicians (India) as the Quiz Master to conduct their All-India level quiz for PG students of respiratory medicine. The NCCP(I) All-India PG quiz programme at Chennai was a grand academic success and succeeded in achieving its objective of promoting scientific temper and identifying young talent from the budding post-graduates, who are one day going to be the future of Pulmonary Medicine in our country.

PHOTOGRAPHS OF NCCP(I) STATE PG QUIZ

DELHI

GUJARAT

HARYANA

HIMACHAL PRADESH

KARNATAKA

KERALA

MAHARASHTRA

ODISHA

PUDUCHERRY

PUNJAB

TAMIL NADU

TELANGANA

UTTAR PRADESH

UTTARAKHAND

WEST BENGAL

PHOTOGRAPHS OF NCCP(I) ALL – INDIA NATIONAL PG QUIZ

A

B

C

D

E

F

G. GROUP PHOTOGRAPH

A. Dr. Vishnu Sharma (Quiz Master) addressing all participants
B & C. Teams qualifying for Grand Round
B. Dr. Arunachalam & Dr. Tanmay Jain (Delhi), Dr. Amal Johnson & Dr. Vaseema Thabassum (Tamil Nadu)
C. Dr. Parvathy Pillai & Dr. Rashmitha MT (Karnataka) , Dr. Archana EV & Dr. Mahroofa LP (Kerala)
D. Award of 1st Prize to Dr. Arunachalam & Dr. Tanmay Jain
E. Award of 2nd Prize to Dr. Archana EV & Dr. Mahroofa LP
F. Award of 3rd Prize to Dr. Amal Johnson & Dr. Vaseema Thabassum
G. Group photograph of All participants, Quiz Master – Dr. Vishnu Sharma, Dr. V. K. Arora, and NCCP(I) team – Dr. S. N. Gaur (Secretary), Dr. S. K. Katiyar (Chair, Scientific Committee) and Dr. Nikhil Sarangdhar (Coordinator)

NAPCON
NATIONAL CONFERENCE OF PULMONARY DISEASES
Joint National Conference of
NATIONAL COLLEGE OF CHEST PHYSICIANS (INDIA)
and
INDIAN CHEST SOCIETY

The National College of Chest Physicians (India) organized several conferences since it was formed. The first conference of NCCP(I) (then IACD) was hosted in 1960 at New Delhi jointly with the Association of Physicians of India and other specialist organisations. Subsequent annual conferences were also held jointly with the Association of Physicians of India till 1963, in which year the Association sponsored the 8th International Congress on Chest Diseases in New Delhi. The following year, the Association held its fourth annual conference independently at New Delhi to which the President of the Royal College of Physicians of Edinburgh was a special invitee and guest of honour. In 1974, it held its annual conference jointly with the Tuberculosis Association of India.

Since 1989, NCCP(I) organised its annual conferences , called NACCON (National Chest Conference). These conferences were very successful and popular and were chaired by the then Presidents of NCCP(I). The Indian Chest Society (ICS) was also hosting its annual national conference, called NCRD (National Congress on Respiratory Diseases). In greater interest of the Pulmonary fraternity of our country, the need to have a united conference of both NCCP(I) and ICS, the two largest national bodies on Pulmonary Medicine was felt. After several positive negotiations and meetings spread over almost 8 years, the President, Secretary and Governing Bodies of both the NCCP (I) and the ICS, evolved a consensus to conduct their joint national conference together. From 1999, the NCCP(I) with ICS is having Joint National Conference on Pulmonary Diseases, called NAPCON. The guidelines for organising NAPCON were finalized to assist the organizers and also to have uniformity in organization and maintain a high academic standard of the scientific programme of NAPCON. NCCP(I) and ICS alternatingly select the venue and organisers of NAPCON each year and a similar turn is followed for selection of Chairperson of the Scientific Committee, which consists of equal number of members from both associations. To promote national integration, each year NAPCON is hosted at a different city and has in turn been organised in the north, south, east and western regions of our country, truly reflecting a pan-Indian character. The NAPCON logo, selected jointly by both associations shows two hands representing both NCCP(I) and ICS working together in harmony.

NAPCON as a joint venture of NCCP (I) and ICS has been a grand success right from the beginning , providing opportunity to every person in the specialty of Pulmonary Medicine to come together under one roof to achieve the maximum scientific benefit. NAPCON has been attended by eminent faculty from the American Thoracic Society (ATS), American College of Chest Physicians (ACCP), European Respiratory Society (ERS), Asia Pacific Society of Respirology (APSR) and other Chest Specialists from abroad and from neighbouring Asian countries. The scientific programmes of NAPCONs are also state-of-the-art and widely acclaimed internationally. Not only Chest Physicians but also Physicians, Critical care specialists, Radiologists, Infectious disease specialists, Microbiologists and Pathologists, Cardiologists and Thoracic Surgeons and learned faculties from other allied specialties are invited to deliver guest lectures or participate in debates, panel discussions, practice changing research and symposia to enrich the diversity and academic content of the scientific programme. The scientific programme covers a plethora of topics on different aspects of respiratory diseases and other allied sciences including critical care, pneumonia, tuberculosis, viral and other respiratory infections, diffuse lung diseases, asthma, COPD, interstitial lung diseases, sleep disorders, cardio-thoracic surgery, lung cancer, bronchoscopy, thoracoscopy and other thoracic interventions, pleural diseases, pulmonary vascular disorders, pediatric pulmonology, respiratory allergy and immunology, environmental and occupational problems, pulmonary imaging, sports medicine and rehabilitation apart from several other topics to constitute a unique academic feast .

Apart from the much-awaited scientific programme, delegates are also given the opportunity to participate in several workshops on a wide variety of topics like pulmonary function tests, imaging, research methods and scientific paper writing, critical care, mechanical ventilation, bronchoscopy and interventional pulmonology, allergy, sleep disorders, interstitial lung diseases, tuberculosis and others to refine their technical knowledge and skills. Satellite symposia and free paper oral and poster presentations add to the academic flavour. The Young budding Chest Physicians and Post-graduates eagerly look forward to the opportunity to present their original research work and more than 700 different abstracts are presented at NAPCON year after year. NAPCON is truly a complete scientific and cultural feast, providing opportunity for many pulmonologists and doctors of other specialties of all ages to meet, interact and have discussion with each other to share their knowledge and experiences to evolve strategies for better management of respiratory diseases .

Right since its inception, NAPCON has grown from strength to strength each year to become one of the largest conferences of Pulmonary diseases in Asia and globally with attendance of nearly 3000 delegates annually. NAPCON is a unique success story in itself, a testimony of unity, strength and cooperation between NCCP(I) and ICS and has evolved into a much sought-after 'Brand name' and 'Status symbol' popular amongst the Chest Physicians and Post-Graduates in India and abroad.

NAPCONs from 1999 till date

Sr. No.	YEAR	VENUE	ORGANISING CHAIRMAN	ORGANISING SECRETARY
1.	1999	Delhi		Dr. J. C. Suri
2.	2000	Kanpur		Dr. S. K. Katiyar
3.	2001	Mumbai	Dr. J. C. Kothari	Dr. Rohini Chowgule
4.	2002	Jaipur	Dr. T. N. Sharma	Dr. N. K. Jain
5.	2003	Coimbatore	Dr. T. K. Moinudeen	Dr. T. Mohan Kumar
6.	2004	Ahmedabad	Dr. Gautam Bhagat	Dr. Rajesh Solanki
7.	2005	Kolkata	Dr. A. K. Ghosh	Dr. A. G. Ghoshal
8.	2006	Nagpur		Dr. B. O. Tayade
9.	2007	Chandigarh	Dr. S. K. Jindal	Dr. Dheeraj Gupta
10.	2008	Lucknow		Dr. Rajendra Prasad
11.	2009	Calicut		Dr. C. Ravindran
12.	2010	Jodhpur	Dr. P. D. Motiani	Dr. K. C. Agarwal
13.	2011	Delhi	Dr. V. K. Vijayan	Dr. Raj Kumar
14.	2012	Bhubaneshwar	Dr. N. K. Gacchayat	Dr. Narayan Mishra
15.	2013	Chennai	Dr. Vijayalakshmi Thanasekaraan	Dr. B. Rajagopalan
16.	2014	Agra	Dr. A. S. Sachan	Dr. Rakesh Bhargava Dr. Santosh Kumar
17.	2015	Jaipur	Dr. N. K. Jain	Dr. Virendra Singh
18.	2016	Mumbai	Dr. K. C. Mohanty	Dr. Agam Vora Dr. Nikhil Sarangdhar
19.	2017	Kolkata	Dr. A. G. Ghoshal	Dr. Dhrubajyoti Roy Dr. Raja Dhar
20.	2018	Ahmedabad	Dr. Rajesh Solanki	Dr. Raj Bhagat Dr. Tushar Patel
21.	2019	Kochi	Dr. C. Ravindran	Dr. Rajesh Venkat

All the twenty-one NAPCONs till date were a grand success, appreciated by members and fellows of both NCCP(I) and ICS, faculty, delegates and post-graduate students, as well as the foreign faculty and delegates. Credit for this success goes to team-work from NCCP(I) and ICS, the Organising Committee and the Scientific Committee for working hard in tandem to ensure fabulous conferences of high repute which are appreciated and acclaimed internationally. We are confident the same spirit will continue, year after year, and we look forward to greater participation as well as better conferences in future.

napcon 2020
VIRTUAL
National Conference On Pulmonary Diseases

January 27 - 31, 2021

www.virtualnapcon2020.com

Dear Colleagues ,

All of us belonging to the fraternity of Pulmonary and Critical care medicine have become front line warriors during the COVID 19 pandemic, as society as a whole relies on largely on our efforts with appreciation for our sacrifices. It is an opportunity for all of us to join hands and take the lead to strengthen our healthcare system by working together.

As You all are aware, NAPCON (National Conference on Pulmonary Diseases) has been jointly organized by the National College of Chest Physicians (India) and Indian Chest Society since 1999. NAPCON has grown each year to become one of the largest and most sought-after conferences of Pulmonary diseases globally. Apart from being a much-awaited academic and cultural event, NAPCON also provides opportunity for many pulmonologists across the country and the world to meet and interact to share diverse opinions and experiences.

The current COVID-19 pandemic with subsequent lockdown and restrictions on travel and gathering has rendered hosting of a physical conference difficult. In the current scenario, across the world, changes are occurring in the way we interact and communicate with each other. Telecommunication has largely shifted to a digital platform, facilitating the exchange of diverse opinions, ideas, knowledge and experiences across people from different parts of the world. Distances and boundaries are no longer what they seemed to be, and the world has evolved into a global digital village.

Keeping in touch with contemporary health dynamics, and to ensure continuity, we have decided to host a Virtual NAPCON 2020.

NAPCON on a virtual platform will be very useful to the delegates for keeping them updated about latest news, events, reports and other information, and it will also bridge communication gaps between all of us, who otherwise, can personally meet only during the conference. A virtual platform will also make it easy for our delegates to interact with each other for sharing their knowledge and experiences, and connect all members to promote better understanding and cooperation.

It is our privilege to invite and welcome You to Virtual NAPCON 2020. We assure that you are going to participate in a state-of-the-art scientific program, which will be rich in academic content, exceptional in its diversity and expertise of national and international faculty in the wide arena of Pulmonary Medicine and which will change the perspective of your day-to-day clinical practice, appealing to the interest of practitioners, post-graduate students, senior stalwarts and budding chest physicians, all alike.

This year we expect participation from a very large number of delegates, post-graduates and foreign faculties from AAPI, GAPI, ACCP, ATS, ERS, APSR, Gulf Thoracic Society and from neighboring countries, as well as a record number of abstracts by young scientists. The Organizing Committee and the Scientific Committee are sparing no efforts to ensure a conference of very high standard and reputation which will be appreciated and acclaimed internationally as a benchmark for virtual medical conferences. NAPCON 2020 will be organized in a highly professional manner to make it a most memorable event which all participants will fondly remember and cherish for years to come.

We are sure You are eagerly looking forward to participate in NAPCON 2020, just as We look forward to greeting You. The schedule and other information regarding NAPCON 2020 will be communicated shortly, and we shall keep you updated from time to time.

Please take care of Yourselves and Your near and dear ones and stay safe and healthy during this COVID-19 crisis.

Prof. Dr. S. N. Gaur
Organizing Chairman, NAPCON 2020
Secretary, NCCP(I)

Dr. Nikhil Sarangdhar
Organizing Secretary, NAPCON 2020

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NAPCON 2020 CORE COMMITTEE

Prof. Dr. S. N. Gaur
Organizing Chairman
Secretary, NCCP(I)

Dr. Nikhil Sarangdhar
Organizing Secretary

Dr. S. K. Katiyar
Chairman, Scientific Committee

President, NCCP(I)
Dr. P. D. Motiani

Dr. Narayan Mishra

Dr. Rajesh N. Solanki

REGISTER ONLINE AT www.virtualnapcon2020.com

REGISTRATION TYPE	REGISTRATION FEE	
	EARLY BIRD (till 30th November 2020)	SECOND SLAB (1st December 2020 onwards)
Member or Fellow of NCCP(I) or ICS	☐ 3540 (3000 + 540)	☐ 4720 (4000 + 720)
Delegate (Non-member)	☐ 4720 (4000 + 720)	☐ 5900 (5000 + 900)
Post-Graduate Trainee / Student *(Institutional I-card or Letter from Head of Department/Institution required)*	☐ 1770 (1500 + 270) or 30 $	☐ 3540 (3000 + 540) or 50 $
Delegates from South-East Asian, SAARC, Middle-East & African Countries	☐ 50 $	☐ 75 $
Delegates from Other Countries	☐ 75 $	☐ 100 $
Accompanying Delegate	☐ 1180 (1000 + 180)	☐ 1180 (1000 + 180)
Workshop	☐ 1180 (1000 + 180) or 20 $	☐ 1770 (1500 + 270) or 30 $

- All rates are in INR (Indian Rupees) unless otherwise specified. Figures in red represent GST.
- Conference registration is mandatory for participation in workshop. Separate registration for workshop alone is not permitted. Those wishing to attend workshop should register for conference also. Workshop registration is on first-come-first-served basis.
- PG students/trainees must also attach and submit scanned copy of ID-card or letter from Head of Department or Institution.
- All National Faculty must Register for the Conference, as per NAPCON guidelines.

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COVID-19 – A Global Meltdown

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Introduction

Coronaviruses (CoV) are zoonotic pathogens (spread from animals to human beings) and constitute the subfamily Orthocoronavirinae in the family Coronaviridae, order Nidovirales and realm Riboviria. In December 2019 there was an epidemic of CoV originating from the city of Wuhan in Hubei province of China which progressed to a pandemic that spread rapidly to several countries of the world. This disease, named COVID-19 (Coronavirus Disease-2019) by the World Health Organization (WHO), continues to be a global threat leading to considerable morbidity and mortality besides serious economic and social repercussions. Herein we provide a short review on the topic.

Epidemiology

Origins

Human coronaviruses were first identified in the mid 1960s. A novel coronavirus (n CoV) was identified in respiratory samples from a cluster of patients suffering from pneumonia of unknown origin in Wuhan city, Hubei province, China on December 31, 2019. Next generation sequencing and phylogenetic analysis revealed this virus to share nucleotide identity with previous coronaviruses causing Severe Acute Respiratory Syndrome (SARS-CoV) by 79% and Middle East Respiratory Syndrome (MERS-CoV) by 51.8% and phylogenetically closest to a bat SARS like CoV genome (sequence RaTG13) by 87.6%, indicating a probable bat origin.[1] It is a single stranded, positive-sense RNA virus belonging to subgenus Sarbecovirus of the genus Betacoronavirus of the family Coronaviridae.[2] Due to its' similarity to SARS-CoV, it was given the nomenclature of SARS-CoV-2 by the International Committee on Taxonomy of Viruses. The WHO coined the term COVID-19 (short for Coronavirus Disease - 2019) for the infectious disease caused by it. Till then, six coronaviruses had been identified to cause human infection, namely HCoV-OC43, HCoV-229E, HCoV-NL63 and HCoV- HKU1 (which usually cause only mild to moderate upper respiratory tract illnesses like the common cold) and MERS-CoV and SARS-CoV (which cause more severe disease), making SARS-CoV-2 the seventh coronavirus known to infect humans.

Transmission Dynamics and Pathogenesis

Majority of the patients in the initial outbreak were linked geographically to the Huanan seafood wholesale market in South China, which also traded live wild animals apart from seafood to cater to local demand for consumption of exotic animals, suggesting a zoonotic origin of the virus.[3] Phylogenetic studies suggest that bats seem to be the reservoir, but intermediate hosts have not yet been identified for COVID-19. Subsequently as the outbreak progressed, a study of a familial cluster of five cases who travelled from Shenzhen city to Wuhan between December 2019 and January 2020 and presented with unexplained pneumonia after returning to Shenzhen first demonstrated the possibility of person-to-person transmission.[4] Direct human spread within close contacts (1-2 meters) via respiratory droplets generated while coughing and sneezing by infected persons is thought to be the main mode of transmission. Spread via contact with oral, nasal, and ocular mucous membranes from fomites have also been postulated.[5] Though SARS-CoV-2 has been isolated from blood and stool specimens, feco-oral transmission is not considered a significant mode of spread.[5] Currently no evidence exists to suggest intrauterine transmission of infection in women who develop COVID-19 during pregnancy. [6]

The incubation period varies between 1 to 14 days (mean of 5.2 days) as per WHO and the Centre for Disease Control and Prevention (CDC). [3,5,7] CoV can be detected in respiratory samples during the early incubation period before the onset of symptoms and remains for 7-12 days in moderate and up to 2 weeks in severe cases.[7] Disease severity is also thought to be an important factor governing viral shedding and transmission.[8] An initial report of spread of infection transmitted during the incubation period has been documented and later refuted.[9,10] However there are increasing reports from endemic areas on potential spread of the infection via close contact with an asymptomatic or presymptomatic patient.[11] Epidemiological surveys suggest that the reproductive number (R_0) i.e. the number of people who acquire the infection from an infected person is 2.2 to 2.68, implying that on an average each patient infects approximately 2.2 other people. [3,12]

The knowledge about spread and pathogenesis of COVID-19 is largely extrapolated from the previous MERS and SARS outbreaks and is limited. Structural analysis suggests that on exposure, 2019-nCoV binds to the Angiotensin-Converting Enzyme 2 (ACE-2) receptor present mainly in the respiratory tract in epithelial cells, alveoli, the trachea and bronchi and also in the renal tubules, intestinal lining and neurons etc. in humans similar to the SARS-CoV causing essentially respiratory illness but with the potential to affect other organ systems as well.[13,14]

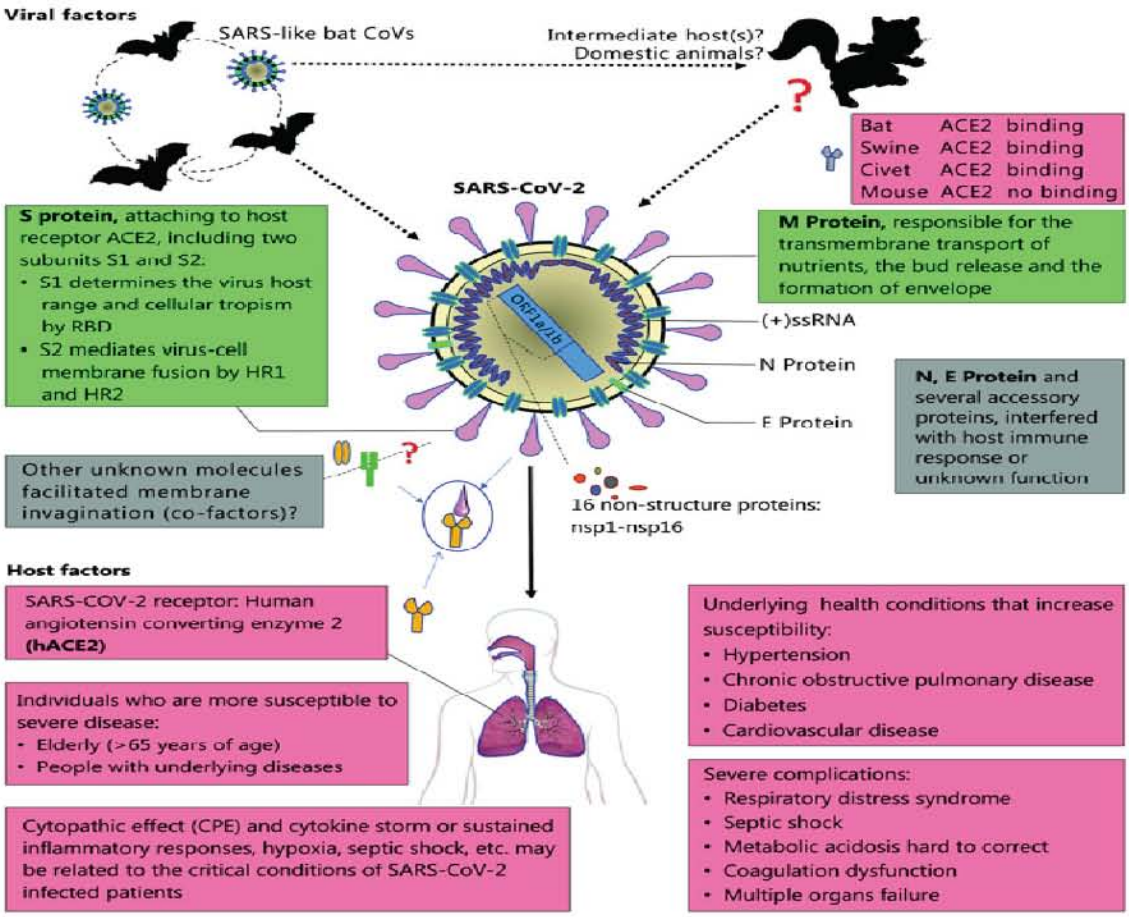

Figure 1. Origin, Structure and Transmission of SARS-CoV-2.[24]

[From : Guo Y, Cao Q, Hong Z, Tan Y, Chen S, Jin H, et al. The origin, transmission and clinical therapies on coronavirus disease 2019 (COVID-19) outbreak – an update on the status. Mil Med Res. 2020 Mar 13;7(1):11.]

Outbreak situation – Declaration as a Pandemic

Despite a lower case fatality rate than reported for SARS (10%) and MERS (34-40%), COVID-19 has so far resulted in more deaths than both combined. After spread in 122 countries and territories with 1,32,758 cases and 4,955 deaths (WHO situation report-53 on 13th March 2020), WHO declared COVID-19 a pandemic on 11th March 2020. Barely 3 weeks later, by 2nd April 2020, COVID-19 had affected 203 countries and territories and 2 international conveyances - the Diamond Princess cruise ship harbored in Yokohama, Japan, and the Holland America's *MS Zaandam* cruise ship, infecting over a million people and causing 50,230 deaths worldwide, with the largest number of cases in the United States (2,35,787), Italy (1,15,242) and Spain (1,10,238), with India reporting 2069 cases and 53 deaths.

Impact and Threat

The COVID-19 pandemic abruptly disrupted global supply chains and international trade as nearly a hundred countries closed national borders, halting the movement of people and tourism. As several nations went into lockdown with restrictions on travel as a strategy to contain viral spread, it is estimated that more than 3 billion people were asked to stay home and maintain social distancing. The United Nations Department of Economic and Social Affairs (DESA) estimated that COVID-19 would precipitate an unemployment crisis, with a decline of almost 10.5 % in total working hours, the equivalent of 305 million full-time workers, putting about 1.6 billion informal workers (nearly half the global workforce) at high risk of losing their livelihoods, apart from pushing 40 to 60 million people into extreme poverty. It is projected that the coronavirus pandemic would result in the global economy shrinking by at least 1% in 2020 (a reversal from the previous forecast of 2.5% growth) and losing nearly $ 8.5 trillion in economic output over the next two years, wiping out nearly all gains of the previous four years.

Clinical Presentation and Investigation Findings

In a retrospective analysis of 4021 COVID-19 patients, mean age of presentation was 49 ± 16 years and disease was rarely seen in children < 20 years, out of which 4.5% had no pneumonia, 25.5% had severe pneumonia and 69.9% had mild illness. Case fatality rate (CFR) was overall 3.06% and highest (9.47%) among elderly male patients diagnosed with severe pneumonia.[15] Mortality was higher in people above 80 years (CFR 21.9%) and patients with co morbidities such as diabetes, hypertension, chronic respiratory illness, cancer, immunosuppression and cardiovascular disease. [7]

The WHO – China joint mission report described signs and symptoms of nearly 55,000 cases to be fever (87.9%), dry cough (67.7%), productive cough (33.4%), fatigue (38.1%), dyspnoea(18.6%), sore throat (13.9%), headache (13.6%), nausea or vomiting (5.0%), nasal congestion (4.8%) and diarrhoea (3.7%).[7] A decreased ability to taste (hypogeusia) and smell (hyposmia) were also reported in a retrospective analysis of hospitalized COVID-19 patients in Wuhan affecting 5.6% and 5.1% of patients respectively.[18]

Preliminary reports suggest that it took on average nearly a week for a patient to develop severe disease (hypoxia) and around 2 to 8 weeks to death. However, in another cohort of 1099 patients, fever was seen only in 43% and cough in 67.8%, with mortality in 1.4% with 2.3% patients requiring mechanical ventilation.[16] On average 23% to 32% of hospitalised patients require intensive or critical care for respiratory support. Hence patients having (or expected to develop) respiratory failure should be considered for admission to an intensive care facility.[6,17]

Computerized tomography (CT) chest scans in affected versus unaffected COVID-19 patients revealed common findings to be ground glass opacities (91 % vs 68%), pneumonia with peripheral distribution (80% vs 57%), fine reticular opacities (56% vs 22%) with less likelihood of lymphadenopathy, pleural effusion or air bronchograms. Lung infiltrates were bilateral in 75% and unilateral in 25% of hospitalised patients.[17] CT findings suggestive of viral pneumonia was found to precede a positive real-time Reverse Transcriptase-polymerase chain reaction (rt RT-PCR) result for SARS-CoV-2 and is the primary imaging modality in China.[6,17] Amongst laboratory parameters, lymphocytopenia was noted in 83% patients. [16]

Acute respiratory distress syndrome (ARDS) was the most common complication seen besides acute kidney injury (AKI), septic shock and disseminated intravascular coagulation (DIC). [16]

Case definitions

As per WHO global surveillance report the current definitions of a tsuspected COVID 19 case are either of the following :

- A patient with acute respiratory tract infection (cough, fever, dyspnea) AND no other etiology that fully explains clinical presentation AND history of travel, residence in a country reporting local or community transmission during 14 days prior to symptom onset.
- A patient with any acute respiratory illness AND close contact with a confirmed or probable COVID-19 case during 14 days prior to symptom onset.
- A patient with SARI (severe acute respiratory infection) and requiring hospitalization AND no other etiology that explains the clinical presentation. [19]

A **probable** case is defined as a suspected case for whom the report from laboratory testing for the COVID-19 virus is inconclusive. [19]

A **confirmed** case is a person with laboratory confirmation of COVID-19 infection, irrespective of clinical signs and symptoms. [19]

The Government of India recently expanded the criteria for COVID-19 suspects to include any one of the following :

- All symptomatic individuals who have undertaken international travel in the last 14 days
- All symptomatic contacts of laboratory confirmed cases
- All symptomatic healthcare personnel (HCP)
- All hospitalized patients with severe acute respiratory illness (SARI) [fever and cough and/or shortness of breath]
- Asymptomatic direct and high risk contacts of a confirmed case (should be tested once between day 5 and day 14 after contact). [25]
- All symptomatic Influenza-like illness (ILI) [fever, cough, sore throat, runny nose] in hotspots (as per MoHFW) and in large migration gatherings/evacuee centres.

Symptomatic refers to fever/cough/shortness of breath. Direct and high-risk contacts include those who live in the same household with a confirmed case and HCP who examined a confirmed case.

Diagnosis

All suspected cases are recommended to undergo testing of respiratory samples by a trained healthcare worker (HCW) using all airborne precautions. Preferably upper respiratory specimens (nasopharyngeal and oropharyngeal swabs) and lower respiratory specimens for patients with productive cough (bronchoalveolar lavage, tracheal aspirate and sputum) must be tested.[5] The main diagnostic modality is real-time Reverse Transcriptase-polymerase chain reaction (rt RT-PCR) for detection of the SARS-CoV-2 virus, which is to be performed in biosafety level 2 (BSL-2) laboratories.[5] Whole genome sequencing is rarely performed for epidemiological studies and serological tests are currently under development. Various antigen and antibody based tests are also available, with variable sensitivity and specificity, awaiting authorisation and FDA approval.

Treatment

Management strategies primarily focus on ensuring appropriate infection control and provision of supportive care. Patients with mild infection may be considered for domiciliary management with advice for isolation and social distancing in order to prevent spread of the infection and self monitoring for possible complications. Supportive management includes fluids, antipyretics, analgesics for symptomatic relief, providing organ support in intensive care units in form of oxygen, non-invasive and invasive mechanical ventilation, ECMO, haemodialysis or renal replacement and others in critically ill patients. Two consecutive respiratory samples for rt RT-PCR need to be negative to demonstrate clearing of infection. Empirical Antimicrobials and Oseltamivir could be considered in patients with suspected infection for other potential pathogens that may cause respiratory infection according to local protocols.

WHO advises against routine use of systemic corticosteroids for the treatment of pneumonia or ARDS unless they are indicated for another reason like exacerbation of asthma or chronic obstructive pulmonary disease (COPD). Glucocorticosteroids have been associated with increased mortality in patients with influenza and delayed viral clearance in patients with MERS-CoV and SARS-CoV infection. For patients with progressive deterioration of oxygenation indicators, rapid worsening on imaging and excessive inflammatory response, a short course (3 to 5 days) of corticosteroids with the dose not exceeding the equivalent of methyl-prednisolone 1-2mg/kg/day may be used.[25]

For pregnant severe and critical cases, pregnancy should be preferably terminated. Consultations with obstetric, neonatal and intensive care specialists (depending on the condition of the mother) are essential.

Various repurposed and investigational drugs claiming benefits in few case reports or animal models are undergoing clinical trials. Numerous anti-viral agents (Oseltamivir, Remdesivir, Lopinavir/Ritonavir, Ganciclovir, Favipiravir, Baloxavir marboxil, Umifenovir, Interferon alfa) are under investigation, however there exists scant evidence to justify their use.[20,21] Traditional Chinese medications, Chloroquine and Hydroxy-chloroquine and Azithromycin have also been tried with inadequate data to support their routine use.[22,23,25]

The Indian National Taskforce for COVID-19 recommends the use of Hydroxy-chloroquine for prophylaxis of SARS-CoV-2 infection for selected individuals as follows :

ELIGIBILITY	DOSE
Asymptomatic healthcare workers involved in the care of suspected or confirmed cases of COVID-19	400 mg twice a day on Day 1, followed by 400 mg once weekly for next 7 weeks *(to be taken with meals)*
Asymptomatic household contacts of laboratory confirmed cases	400 mg twice a day on Day 1, followed by 400 mg once weekly for next 3 weeks *(to be taken with meals)*

Table 1. Hydroxy-chloroquine for prophylaxis of COVID-19

The use of Hydroxy-chloroquine is not recommended for prophylaxis in children < 15 years of age and contra-indicated in persons with retinopathy and known hypersensitivity to it and 4-aminoquinoline compounds.

The revised guidelines on clinical management of COVID-19 prepared by the Ministry of Health & Family Welfare, Government of India mention that no specific antiviral drugs have been proven to be effective as per current data. However, based on available information from uncontrolled clinical trials, the combination of Hydroxy-chloroquine (400mg twice daily for 1 day followed by 200mg twice daily for 4 days) in combination with Azithromycin (500 mg once daily for 5 days) may be considered for off-label use in patients with severe disease and requiring ICU management. This should be administered under close medical supervision with monitoring for adverse effects including QTc interval and is not recommended for children less than 12 years of age, pregnant and lactating women.[25]

It is important to keep in mind that COVID-19 suspects or cases and their close contacts, relatives and caregivers often suffer from anxiety and concern and should be supported by psychological counselling. Frequent exposure to news including daily public announcements about coronavirus, can give rise to variable emotional, somatic or behavioural responses with the potential to affect mental as well as physical health. It is important to follow all precautions, avoid panic, keep oneself and family well informed with authentic or official news, be aware of any reactions and announcements (local or national) to the outbreak and follow strategies to cope with fear and distress.

Infection Control and Prevention

All suspected cases of COVID-19 should be immediately triaged, provided with a face mask and shifted to an isolation room or observation centre maintaining a distance of 6 feet from other patients, with instructions to practise hand hygiene and cough/sneeze etiquette. Apart from following respiratory and contact precautions, doctors and other healthcare workers coming in close contact with patients should wear personal protective equipment (PPE), gloves, face masks and eye goggles. Additionally, airborne precautions are warranted during all aerosol-generating procedures such as tracheal intubation, non-invasive ventilation, cardiopulmonary resuscitation and bronchoscopy mandating the use of N-95 masks and eye shields besides other PPE. The virus may remain viable on surfaces for up to 9 days; hence CDC recommends routine environmental cleaning, waste disposal and disinfection of laundry and utensils.

Standard public recommendations to prevent transmission of COVID-19 include frequent cleaning of hands using sanitizers, soap and water or alcohol-based hand rub solutions, covering the nose and mouth with cupped hands, flexed elbows or disposable tissues while coughing and sneezing and avoiding close contact with anyone who is febrile or exhibits respiratory symptoms. Social (or physical) distancing, defined as a set of non-pharmaceutical interventions or measures taken to prevent the spread of any contagious disease by maintaining physical distance between persons and reducing the number of times people come into close contact with each other, has gained prominence during COVID-19.

Development of a safe and effective COVID-19 vaccine is of paramount importance. Multiple vaccine trials incorporating recombinant proteins, inactivated whole virus, mRNA, DNA and recombinant adenovirus are under development. However, it is expected to take several months before any of the candidate vaccines are approved for clinical use.

Disposal of Dead Bodies

It is recommended that disposal of dead bodies of COVID-19 patients is done ensuring proper use of PPE and other precautionary measures, followed strictly by the concerned staff and preferably in an electric crematorium. The body should be disinfected with 1% sodium hypochlorite and placed in a body bag, the exterior of which must again be decontaminated with 1% sodium hypochlorite solution. It is advisable that the corpse of a COVID-19 victim should not be handed over directly to family members or relatives, and they should refrain from hugging, kissing, bathing or embalming the corpse prior to the last rites in order to minimize any risk of viral transmission. Large gathering at the crematorium or burial ground should be avoided as a social distancing measure. Viewing of the corpse by unzipping the face end of the body bag (by the staff using standard precautions) may be permitted for relatives to see the body prior to cremation or burial. Religious rituals such as reading from scriptures, sprinkling holy water and any other last rites that do not require touching of the body can be allowed. The ash does not pose any risk and can be collected. The funeral staff and family members should perform hand hygiene after cremation or burial. [26]

Summary

- COVID-19 is a new viral disease caused by a novel corona virus originating from Wuhan, China in December 2019.
- Rapid and widespread dissemination of COVID-19 worldwide led to its declaration as a pandemic by WHO.
- Common clinical features include fever, cough, sore throat, coryza, dyspnoea and a majority (70-80%) of cases are of mild severity.
- Around 20% patients may require hospitalization due to complications like ARDS, shock, acute kidney injury and others.
- Mortality is seen in about 2-3% cases and risk factors include advanced age and presence of co-morbidities like diabetes, chronic respiratory or cardio-vascular diseases.
- Diagnosis commonly involves RT-PCR from upper or lower respiratory samples.
- Prevention against contracting disease is of utmost importance and involves among others isolation of diagnosed and/or suspected cases, quarantine of vulnerable contacts, respiratory and cough hygiene, regular handwashing and others.
- Treatment is mainly supportive.

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Fluid Resuscitation in Critically Ill Patients - Current Status

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Introduction

The search for an ideal fluid for resuscitation is never- ending. An ideal fluid is one which is chemically similar to plasma, produces a predictable increase in intravascular volume, is completely metabolised, excreted, cost-effective and easily available. In critically ill patients, apart from resuscitation, intravenous fluids also serve as carriers for medications and parenteral nutrition and maintain total body water and electrolytes. Intravenous fluids for use in the Intensive Care Unit (ICU) include crystalloids like normal saline (NS), ringer lactate (RL), plasmalyte (PL) and colloids like albumin, gelatin, etc.

Fluid bolus refers to the rapid infusion of fluids over a short period of time. In practice, a fluid bolus is usually given to correct hypovolemia, hypotension, inadequate blood flow or impaired microcirculatory perfusion. The volume of fluid in a bolus is typically 500 - 1000 mL, but may vary according to indication and patient condition. The minimum fluid volume capable of increasing the backward pressure of venous return is 4 mL/kg . Fluid challenge is a dynamic test to assess fluid responsiveness by giving a bolus and simultaneously monitoring the hemodynamic effect. Daily fluid balance is the sum of all fluid intakes and outputs over 24 hours and the cumulative fluid balance is the sum of daily fluid balances over a set period of time. Fluid intake includes resuscitation as well as maintenance fluids. Outputs include urine, ultrafiltration fluids, third space or gastrointestinal losses. Maintenance fluids are used only to cover daily needs, and their prescription should take other sources of fluids and electrolytes into account.

Current Status of Fluid Resuscitation in the Critically Ill

- The theoretical advantage of volume preservation with use of albumin was not found in the results of clinical trials. SAFE trial found albumin to be equivalent to NS in resuscitation. [1] Post-hoc analysis suggested a better outcome in sepsis, but this was refuted by the results of the ALBIOS trial.[2]
- Gelatins and starches like HES have been found to increase requirement of renal replacement therapy (RRT) and death in CRISTAL and CHEST trials and are no longer preferred as fluids of choice for resuscitation.
- Therefore, the battle remains among the crystalloids. Till 2013, evidence of RL/PL being better than NS was present from small retrospective studies. Randomized controlled trials like SPLIT and SALT found no difference in efficacy.
- The SALT-ED and SMART trials in 2018 found RL/PL superior to NS in a composite score of death, RRT and persistent renal dysfunction, with non-significant differences in the individual components. [3,4] Subsequent meta- analyses also showed no benefits with respect to mortality or RRT requirement of RL/PL.[5]
- Thus, none of the currently used resuscitation fluids are actually 'physiological' and questions regarding their efficacy and safety remain unanswered. The results of ongoing BASICS and PLUS studies which compare NS vs RL/PL in critically ill patients with mortality as the primary outcome may add to our understanding of the efficacy of fluids in sepsis. [6,7]

A new model of fluid dynamics is evolving which is particularly specially for sepsis. A web of membrane-bound glycoproteins and proteo-glycans on the luminal side of endothelial cells has been identified as the endothelial glycocalyx layer. The subglycocalyx space produces a colloid oncotic pressure that is an important determinant of transcapillary flow. It is damage to this in sepsis that leads to fluid loss even before fluid accumulation in the third space. Thus, resuscitation should be quick and appropriate. Sepsis-3 aims at a 1-hour bundle where fluid resuscitation is started at 30mL/kg for hypotension or lactate > 4 mmol/L. The end point and choice of crystalloid is not defined. After fluid bolus therapy, further fluid responsiveness is to be assessed after dynamic monitoring particularly in septic patients and patients with acute lung injury. The choice between colloids and crystalloids should take into account the revised Starling equation and the glycocalyx model of transvascular fluid exchange . When capillary pressure (or transendothelial pressure difference) is low, as in hypovolemia or septic shock, or during hypotension after induction and anaesthesia, albumin or plasma substitutes have no advantage over crystalloid infusions, since they all remain intravascular.

Positive fluid balances are associated with poor outcomes in critically ill patients; hence all fluids should be treated as drugs. One should follow the principles of 4D (D - Drug, Dosing, Duration, De-escalation) and ROSE (R-Resuscitation phase, O-Optimization phase, S-Stabilization phase, E-Evacuation phase).

Dynamic parameters like Pulse pressure variation (PPV), Systolic pressure variation (SPV), Stroke volume variation(SVV), End-tidal CO_2 variation and Caval index are preferable to measure and monitor status rather than static parameters like Central venous pressure (CVP), Pulmonary artery occlusion pressure (PAOP), Global end-diastolic volume, IVC diameter and Left ventricular end diastolic area. Thus, an Ultrasound/Echo machine, arterial lines and advanced monitors with appropriate training of the intensivist is the need of the hour. Fluid administration beyond initial resuscitation requires careful assessment of the likelihood that the patient remains fluid responsive.

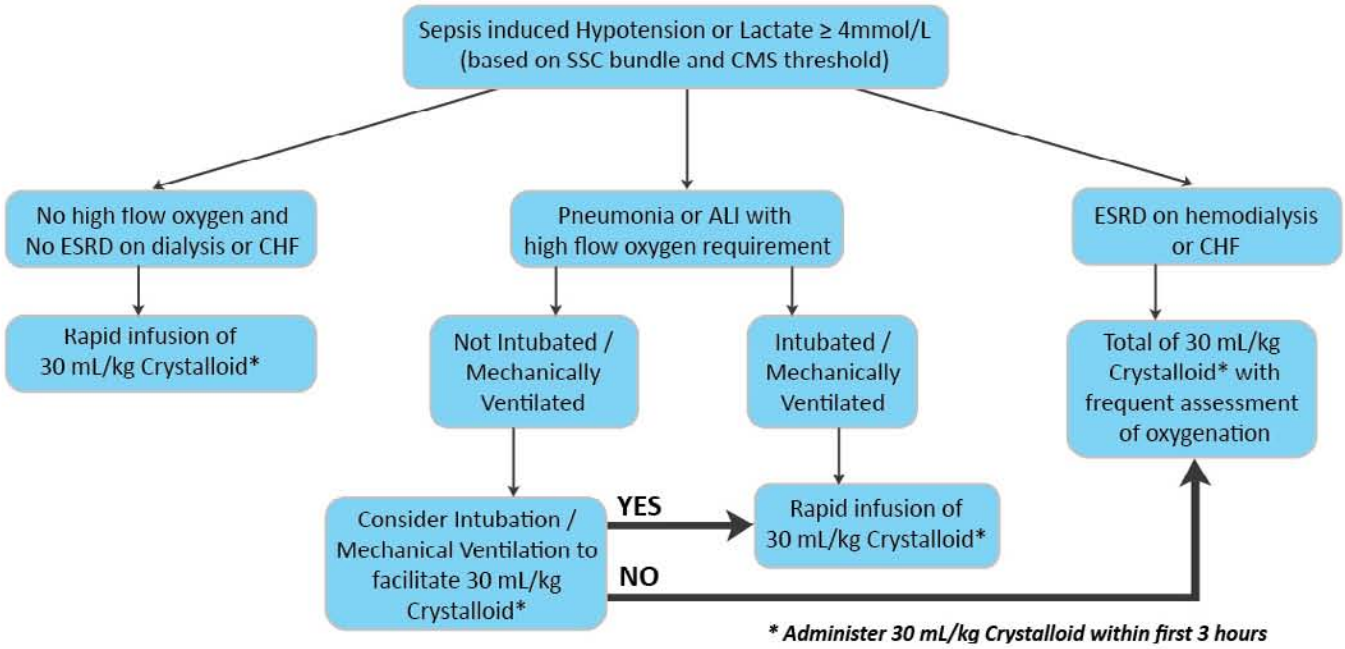

Figure 1. Application of Fluid Resuscitation in Septic Shock.[8]

[From: Dellinger RP, Schorr CA, Levy MM. A Users' Guide to the 2016 Surviving Sepsis Guidelines. CritCare Med. 2017 Mar;45(3):381-5]

Summary

- Sepsis-induced hypoperfusion is life-threatening and may portend death if not recognized and treated promptly.
- Elevated lactate levels are an important indicator of cellular or metabolic stress impending shock in the absence of hypotension. The combination of hyperlactatemia with fluid resistant hypotension identifies a group of patients at higher risk of mortality .
- In patients with septic shock, hemodynamic stabilization with intravenous fluids remains a major therapeutic challenge as numerous questions remain regarding the type, dose and timing of fluid administration.
- Fluid resuscitation to correct hypovolemia and support organ perfusion is central to the management of critically ill patients in severe sepsis and/or septic shock, however the ideal fluid volume and endpoints in resuscitation remain unknown.
- A positive fluid balance is associated with poor outcome in sepsis whereas as to whether conservative fluid management can improve sepsis outcomes requires further study.

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PREFACE

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Dear Colleagues,

National College of Chest Physicians (India) [NCCP(I)] welcomes You to the second section of our NCCP(I) Newsletter - Lung Bulletin. In my previous message as Editor, NCCP(I) Lung Bulletin I mentioned that each issue would be bifurcated into two sections, a general section, followed by a specific section focussed on a particular disease or area of interest in Pulmonary Medicine. You may wonder why we chose to dedicate this section of the inaugural issue of Lung Bulletin to Pulmonary Hypertension.

Well, I did mention that the challenges in meeting the healthcare needs of our country are compounded by the shift from communicable to non-communicable diseases (NCDs), a trend which has occured over the last few decades. Several NCDs come to the mind of the Practising Pulmonologist as chronic respiratory diseases (CRDs), to name a few – Asthma, Respiratory Allergy, Bronchiectasis, Chronic Obstructive Pulmonary Disease, Interstitial Lung Diseases and Sleep disorders, apart from Pulmonary Hypertension. Most of these are common causes of respiratory symptoms and account for a large chunk of outpatient consultations as well as indoor admissions in our day-to-day clinical practice. Yet all CRDs have one thing in common, in that if allowed to progress due to delays in diagnosis and management, they lead to the development of hypoxia and subsequently Pulmonary Hypertension (PH).

PH symptoms are often non-specific, overlapping with and difficult to differentiate from the symptoms of underlying lung or cardiac disease and tend to be missed on routine history and physical examination. Nearly one-fifth of PH patients are symptomatic for more than two years before this disorder is recognized. To complicate matters, PH may be asymptomatic until severe, when right heart failure develops and this leads to considerable delay between the onset of symptoms, the time of diagnosis and appropriate treatment. PH portends poor prognosis if not promptly diagnosed and treated, and frequently complicates the clinical course of patients with CRDs, being associated with hypoxia, diminished lung function, reduced exercise tolerance and functional capacity, more oxygen requirement, impaired quality of life and greater morbidity and mortality. It is imperative to keep in mind a high degree of suspicion of PH while dealing with CRDs and other causative etiologies in order to establish a prompt diagnosis. As the diagnosis of PH is likely to confer a degree of social isolation and uncertainty regarding future course of the disorder, patients also need advice and counseling about learning to accept and live with PH and adapt to disease severity, including activities of daily living, in addition to treatment.

Treatment modalities for PH have advanced considerably since the last decade. Today PH treatment is no longer restricted to oxygen supplementation and drugs, rather it has evolved into a complex strategy that incorporates evaluation of disease severity, exercise capacity, treatment response and pulmonary hemodynamics. Treatment strategies do help to alleviate symptoms, slow down progress and improve survival but are often complex and require extensive monitoring and follow-up care. Identifying the most appropriate treatment for each case of PH can be time-consuming and requires a great deal of patience on part of the physician. Hence, PH poses a challenge for all of us in clinical practice, for timely diagnosis as well as optimum management for better symptom relief and enhanced survival. It is for this purpose that we wish to enhance knowledge, awareness and understanding about the etiology, pathophysiology, clinical presentation, diagnosis, assessment, monitoring and management of Pulmonary Hypertension in our fraternity of Chest Physicians as well as our colleagues in the entire medical profession.

Decades ago, medical education was based on bedside teaching and examples set by senior colleagues and teachers. Respected teachers of medicine in the past consistently shared their vast experience, knowledge and learning with students and spared no attempts to groom them into good doctors as role models for the future. The shift from clinical acumen towards evidence-based medicine, which some justify as the need of the hour in this era of lawsuits, has led to long lists of investigations replacing history and clinical judgement while attempting diagnosis. A point of great concern is that when patients complain of more symptoms, the longer the list of prescribed investigations grows. We need to keep in mind the health care needs and resources of the majority of our country's population. Investigations are certainly important, but they should supplement rather than substitute for good history and clinical examination. Equal importance should be accorded to both. Even in today's era of medical practice where priority is given to investigations, there still exists an opportunity for the clinical judgement of the physician to reign supreme, as accurate diagnosis and treatment require the application of both together.

Unfortunately, the clinical approach is often neglected in this current era of evidence-based medicine. For us as doctors, practice without understanding theory is blind, as without correct knowledge, once can unknowingly do wrong practice. To believe in practice without theory is to be like a captain who boards a ship without sails, rudder and compass and never knows which route to follow. Theory without practice is of little value by itself, whereas practice is the proof of theory, hence both are incomplete without each other. For You as a doctor, theory provides knowledge whereas practice the ability to test this knowledge along with your skill and intuition in real life when the patient is in front of You.

One of the objectives of NCCP(I) is to promote good standards of clinical practice which we believe will enhance the future of Pulmonary Medicine in India and drive our specialty forward. A systematic approach is required to understand any disease and gain working knowledge and skills necessary for its management. We introduce a novel concept incorporating both theoretical knowledge about basic sciences and practical experience in the form of case reports about PH. As a teacher and clinician, I have always emphasized the relevance of history and clinical examination as I believe every patient has a different story to tell, and if we are astute enough to pick up valuable clues, the path towards diagnosis and management is simplified. This is reflected in the real-life case reports on PH in many common chronic respiratory diseases which all of us are likely to come across in practice, and we hope these will provide valuable insight and promote good ethical clinical practices ensuring standards of care for PH patients across India as well as beyond our shores.

India is as diverse as it is vast, and as its citizens we respect and uphold cultural integrity along with unity in our diversity. NCCP(I) believes in acknowledging both seniority and young talent and promoting clinical expertise along with evidence-based medicine though a pan-Indian approach. As You read further, You would realise that we have carefully selected from a pool of the best authors of all ages from premier government medical colleges as well as private teaching hospitals spanning the whole of India, from states like Jammu & Kashmir and Uttar Pradesh in the north, Rajasthan in the west, Assam in the north-east, Karnataka, Kerala and Tamil Nadu in the south and of course our national capital of Delhi to share their knowledge, experience, skills and views about Pulmonary Hypertension with You, reflecting the importance we attach to cultural diversity and national representation. While compiling Lung Bulletin, we have given equal importance to the young, senior as well as middle-aged Chest Physicians, both as authors and readers, cutting across regional, religious, cultural and other differences, keeping true to the vision of our founders.

To successfully diagnose and treat any disease, one needs to understand its origins, causes, pathogenesis, physiology, clinical features, tools for diagnosis, modalities for assessment and monitoring and finally, strategies for management. Clinical presentation in the later stages of a disease is often a reflection of the underlying etiology and pathophysiology which began in earlier stages, and knowledge about these in tandem greatly assists the physician while suspecting a disease or cause and provides further guidance towards making a confident diagnosis and accurate severity assessment, which are essential to initiate appropriate treatment for relief of the patient's symptoms or condition. Guidelines, advisories and recommendations ensure standards of care at all levels. Thus this section contains chapters that impart theoretical knowledge about basic sciences, clinical features, diagnosis and treatment of PH, followed by real-life practical case reports which, though concise, provide a comprehensive review of theory and practice applied to each case in a nutshell.

I also wrote that Lung Bulletin is compiled keeping in mind the needs and aspirations of the young budding pulmonologist. Hence, it is not only meant to be a concise source of knowledge and but also an update on clinical experience on the subject to the reader. This section is uniquely designed, amalgamating theoretical information with clinical expertise in the form of real-life case reports with a systematic approach. It is meant to be different from the classical textbook, yet attract and stimulate the minds of avid readers as a short treatise on PH which everyone would like to keep ready for referral as a handy guide for theory and practice while learning as post-graduate students or teaching at institutions or dealing with PH cases as consultants during clinical practice.

I compliment our authors for their hard work, as all articles and case reports were meticulously written. I have tried to enhance the academic content in all articles and case reports by adding to the text or creating tables, and simplify the understanding of basic sciences in some by drawing my own diagrams. All articles and case reports have been compiled and edited to follow a standard pattern. Each article on the theoretical aspects of PH includes introduction and summary, and each case report ends with a discussion incorporating useful practice points. All contain references for those who wish to read further. I hope both teachers and students of Pulmonary Medicine as well as young Chest Physicians who have just started practice will find it useful and interesting as a one-stop source of information on PH.

I personally appreciate all authors in this section for being prompt in the submission of their articles and case reports on PH especially in these devastating times while COVID-19 continued to wreak havoc and ravage the world around us. I would like to place on record that most of our authors were active and busy with official COVID-19 duties in their respective states and institutions and were hard pressed for time, yet all were always accessible, responsive and supportive, almost like a family throughout this endeavour. Refining each article and case report to meet standards was an uphill task rendered possible only with their cooperation, and I am particularly grateful to them for exhibiting patience, especially while accomodating multiple attempts and requests from me to fine-tune their submissions.

I have always cherished the importance of the 'personal touch', be it during organizing NAPCON 2016, coordinating NCCP(I) PG quiz and other academic activities and welcome inputs from all of You, whether you happen to be post-graduate medical students, teachers or practising consultants in the field of Pulmonary Medicine to take Lung Bulletin to greater heights. Please feel free to write to me at ncsarangdhar@rocketmail.com.

Wish You All Pleasant Reading !

Epidemiology of Pulmonary Hypertension

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Introduction

Pulmonary Hypertension (PH) is a pulmonary vascular disorder of diverse etiology. PH was originally defined by the first World Health Organization (WHO) international symposium as a mean pulmonary arterial pressure (mPAP) ≥ 25 mmHg at rest. This definition, though precise, is no longer arbitrary, as recent data from normal subjects suggests that mPAP > 20 mmHg could be above the upper limit of normal. However, merely an abnormal elevation of mPAP alone might not suffice to define PH, which could also be due to increased cardiac output or pulmonary arterial wedge pressures, thus, the sixth World Symposium on PH proposed to include pulmonary vascular resistance ≥ 3 Wood Units in the definition of all forms of pre-capillary PH associated with mPAP > 20 mmHg. [1]

History

The history of PH is unique among non-communicable diseases. PH was first described in 1891 by Ernst von Romberg as lesions of pulmonary vascular stenosis in autopsy specimens. The first drug Epoprostenol became available a century later after Vane, Bergstrom and Samuelson were awarded the Nobel Prize in 1982 for their research on prostaglandins. Consumption of Aminorex, a popular weight loss medication, led to a surge in PH in Europe in 1965, prompting the WHO to host an international symposium for better recognition and awareness about PH in 1973. In the United States, the first registry on primary PH incorporating data on age, gender and survival was established by the National Institutes of Health (NIH) in 1981. Widespread use of another appetite suppressant fenfluramine led to a second surge of PH cases in 1992.[2] A second WHO symposium in 1998 classified PH etiologies into five clinical groups based on data from North America and Europe, however, scant attention was paid to PH in developing countries.

Epidemiology

PH is an uncommon disease. Studies from France and Scotland revealed the incidence of pulmonary arterial hypertension (PAH) to range between 2.5 to 7.1 cases per million and prevalence from 5 to 52 per million adults. Nearly half the patients in registries had idiopathic or heritable PAH and the remainder associated PAH. The commonest etiology for associated PAH was connective tissue disease (particularly Scleroderma) followed by congenital heart disease. The French PH registry revealed a higher prevalence of associated PAH attributable to drugs like anorexigens and HIV infection compared to American registries, whereas in China PAH associated with congenital heart disease was found to be more common. [3] The incidence of PAH associated with portal hypertension or HIV infection is estimated to be 0.5 to 2%. [4] In India, conditions like chronic respiratory diseases including post-tubercular sequelae, HIV infection, portal hypertension as well as pulmonary venous hypertension due to rheumatic heart disease are expected to contribute greatly to PH prevalence in our country. The PH registry of Kerala, a multi-centric hospital-based registry reported the etiology of PH as secondary to left heart disease in 59% (valvular and congenital heart disease accounting for 27% and 14.6% respectively), chronic obstructive pulmonary disease in 10.6%, idiopathic in 5.8% and chronic thromboembolic PH in 3.8% of 2003 patients respectively.[5] One of the drawbacks of database registries is that they are likely to represent only a fraction of patients as accurate estimates of PH prevalence are difficult to obtain, more so in developing countries like ours, not only due to social, cultural and ethnic diversity but also wide regional differences in healthcare infrastructure and delivery, as several patients are unable to reach centers equipped with adequate expertise and capacity for management.

Socio-Economic Burden

Due to its low prevalence PH is unlikely to be given the attention it deserves in global, national or state health budgets. Across the world, the economic burden of PH falls on patients and payers as the state plays a minimal role. PH is considered a 'high cost' disease, as patients might spend about $25,000 to $50,000 annually. In France, the cost of PAH-related hospitalizations was estimated to be €3.6 million per year at a mean cost of €2,864 per stay, with stays for disease worsening accounting for 51% of the annual cost. [6] Direct costs represent utilization of medical resources from the public health perspective, whereas indirect costs refer to expenses that are important from the individual perspective but which health plans do not budget for, such as work absenteeism or a spouse who must give up his or her job to take care of the affected patient, thus impacting not only patients but also families, employers and societies.

Summary

- PH, though an old and uncommon disease, continues to pose a tremendous burden on patients and healthcare systems.
- Knowledge about the natural history, causes and impact of PH continues to evolve, with the potential to provide opportunities for greater economic savings through improved management of patients and optimization of resources.

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Etiology of Pulmonary Hypertension

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Introduction

Pulmonary Hypertension (PH) is a disease with complex pathophysiological mechanisms and varied etiologies. It is very important to understand its etio-pathogenesis in view of therapeutic implications. To help simplify this complex topic the World Symposium on Pulmonary Hypertension has been regularly updating knowledge on this disease, since its first conference way back in 1973.

PH was initially defined by the first World Symposium on Pulmonary Hypertension, as mean pulmonary arterial pressure (mPAP) ⩾25 mmHg at rest, measured by right heart catheterization. However recent data have identified normal mPAP as 14.0 ± 3.3 mmHg in healthy subjects and two standard deviations above this value would mean mPAP above 20 mmHg to qualify as PH.

Classification

Broadly, PH may be classified in two ways. The first is a hemodynamic classification. This helps us to characterize PH as well as understand its pathophysiology eg. PH due to a cardiac or pulmonary cause or due to intrinsic disease of the pulmonary vessels. Pulmonary artery wedge pressure (PAWP) and Pulmonary Vascular Resistance (PVR) are two parameters which are used to further classify PH as pre-capillary, post-capillary or combined (Table 1).

Pre-capillary PH	mPAP >20 mmHg PAWP ≤15 mmHg PVR ≥3 WU (Wood Units)
Isolated post-capillary PH (IpcPH)	mPAP >20 mmHg PAWP >15 mmHg PVR <3 WU
Combined pre- and post-capillary PH (CpcPH)	mPAP >20 mmHg PAWP >15 mmHg PVR ≥3 WU

Table 1. Hemodynamic Classification of Pulmonary Hypertension

The second classification is clinical, as from the clinician's perspective one way of understanding PH would be to group various etiologies with common pathophysiology. The sixth World Symposium on Pulmonary Hypertension has categorized the various etiologies causing PH into five major groups (Table 2).

Group 1: Pulmonary Arterial Hypertension (PAH)

This group includes PAH due to Idiopathic and inherited causes. Various Drugs and Toxins such as Aminorex, Fenfluramine, Dexfenfluramine etc. are known to have definite associations with PAH. Other diseases in this group include connective tissue diseases, HIV, portal hypertension, schistosomiasis, persistent pulmonary hypertension of the new born and pulmonary veno-occlusive disease/pulmonary capillary hemangiomatosis (PVOD/PCH). Another distinct entity in this group is PAH in patients who are long term responders to therapy with calcium channel blockers for at least one year.

Group 2: PH due to left heart disease

This group includes PH due to significant left heart disease. Echocardiography will help to identify this subset of patients with reduced left ventricular ejection fraction, valvular and congenital heart diseases. This group can also be classified into post-capillary hypertension.

Group 3: PH due to lung diseases and/or hypoxia

Various obstructive lung diseases such as chronic obstructive pulmonary disease (COPD) or restrictive lung diseases such as interstitial lung disease (ILD) can lead to PH. Similarly diseases which have mixed obstructive and restrictive pattern such as bronchiectasis can lead to PH in later stages. Similarly, conditions without lung disease but with underlying untreated obstructive sleep apnea (OSA) can also lead to PH. Lastly, this group also includes PH due to developmental disorders of the lung.

Group 4: PH due to pulmonary artery obstruction

PH can occur due to long standing thrombi occluding the pulmonary artery which is referred to as chronic pulmonary thromboembolic hypertension (CTEPH). Similarly there could be obstruction due to angiosarcoma or in association with malignancies such as renal carcinoma, uterine carcinoma, germ cell tumors or benign conditions such as uterine leiomyoma or parasitic infection such as Schistosomiasis. Similarly pulmonary artery inflammation without evident connective tissue disease and congenital pulmonary artery stenosis are also included in this group.

Group 5: PH with unclear and/or multifactorial mechanisms

Hematological diseases such as hemolytic anemias and myeloproliferative disorders which are responsible for PH due to diverse mechanisms such as altered blood viscosity, endothelial dysfunction, thromboembolism etc. Diseases such as pulmonary Langerhans cell histiocytosis (pLCH), Gaucher disease, glycogen storage diseases and neurofibromatosis are associated with PH and the pathophysiological mechanisms of its development are multifactorial and complex. Finally patients of chronic renal failure, fibrosing mediastinitis and complex congenital heart diseases are also included in this group.

Group 1	**Pulmonary Arterial Hypertension (PAH)** 1.1 Idiopathic PAH 1.2 Heritable PAH 1.3 Drug and toxin induced PAH 1.4 PAH associated with: 1.4.1 Connective tissue disease 1.4.2 HIV infection 1.4.3 Portal hypertension 1.4.4 Congenital heart disease 1.4.5 Schistosomiasis 1.5 PAH long term responders to calcium channel blockers 1.6 PAH with overt features of venous/capillaries (PVOD/PCH) involvement 1.7 Persistent PH of the newborn syndrome
Group 2	**PH due to left heart disease** 2.1 PH due to heart failure with preserved LVEF 2.2 PH due to heart failure with reduced LVEF 2.3 Valvular heart disease 2.4 Congenital/acquired cardiovascular conditions leading to post-capillary PH
Group 3	**PH due to lung diseases and/or hypoxia** 3.1 Obstructive lung disease 3.2 Restrictive lung disease 3.3 Other lung disease with mixed restrictive/obstructive pattern 3.4 Hypoxia without lung disease 3.5 Developmental lung disorders
Group 4	**PH due to pulmonary artery obstructions** 4.1 Chronic thromboembolic PH 4.2 Other pulmonary artery obstructions
Group 5	**PH with unclear and/or multifactorial mechanisms** 5.1 Haematological disorders 5.2 Systemic and metabolic disorders 5.3 Others 5.4 Complex congenital heart disease

Table 2. Updated Clinical Classification of Pulmonary Hypertension (PH). [1]

[PAH: pulmonary arterial hypertension; PVOD: pulmonary veno-occlusive disease; PCH: pulmonary capillary haemangiomatosis; LVEF: left ventricular ejection fraction]

Summary

- PH is defined as mPAP more than 20 mmHg at rest.
- Hemodynamic classification includes pre-capillary, post-capillary and mixed types which require PVR and PAWP to be defined.
- For a clinician managing PH it is necessary to systematically evaluate and rule out the various etiologies in different groups before labeling it as Idiopathic PAH, since it has therapeutic implications.

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Pathophysiology of Pulmonary Hypertension

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Introduction

Pulmonary Hypertension (PH) is a devastating, life-threatening condition that includes a heterogenous group of disorders characterised by elevated pulmonary vascular resistance (PVR) and elevated mean pulmonary artery pressure >25 mmHg at rest or 30 mmHg with exercise.

Subgroups

Pulmonary hypertension (PH) consists of several subgroups such as pulmonary arterial hypertension (PAH), pulmonary veno-occlusive disease and/or capillary haemangiomatosis, PH due to heart disease, PH due to pulmonary diseases and/or hypoxia, chronic thromboembolic pulmonary hypertension (CTEPH), and PH with undetermined or multifactorial mechanisms. [1] Of them, the three key subgroups are PAH, CTEPH and PH associated with lung diseases and/or hypoxia.

Pathogenesis

The pulmonary vascular bed is normally a low-resistance, high-capacitance circuit capable of accommodating the entire cardiac output at pressures approximately 15% - 20% of those in the systemic circulation. In PH, elevated pulmonary arterial pressure places a burden on the thin-walled right ventricle as it struggles to maintain blood flow.

PAH - Pathogenesis of PAH involves remodelling of small pulmonary arteries (< 500 µm diameter) via the abnormal proliferation of smooth muscle and endothelial cells.[2] There is hypertrophy of the media and intima, and formation of plexiform lesions at the bifurcation of the pulmonary artery. PAH can be associated with genes encoding bone morphogenetic protein receptor type II (BMPR-2), activin receptor-like kinase (ALK-1) and others, congenital systemic to pulmonary shunts, systemic sclerosis, HIV infection and exposure to certain drugs and toxins.[3]

CTEPH - CTEPH is an uncommon, progressive pulmonary vascular disease developing after acute pulmonary embolism. The condition begins with persistent obstruction of large and/or medium-sized pulmonary arteries by organised thrombi. These thrombi fail to resolve due to abnormal fibrinolysis or underlying haematological or autoimmune disorders. Even small vessel abnormalities developing in these obstructed areas are likely to contribute to hemodynamic compromise which develops in the background of prominent obstruction in the proximal pulmonary arteries. [4] CTEPH may result from single or recurrent pulmonary thromboembolism (PE) arising from sites of venous thrombosis or in situ thrombosis in the lung due to primary arteriopathy and endothelial dysfunction. [5] The condition may also be noted in the presence of anti-phospholipid antibodies, splenectomy, ventriculo-atrial shunt or an infected pacemaker. [3]

PH associated with pulmonary diseases and/or hypoxia - PH may be associated with chronic obstructive lung disease (COPD), sleep disordered breathing, alveolar hypoventilation disorders, chronic exposure to high altitude and alveolar capillary dysplasia. [6] Development of PH in COPD is complex and multifaceted. Hypoxia plays a pivotal role. Other mechanisms involved in the pathogenesis of increased pulmonary vascular resistance include acidemia, vascular remodelling, endothelial dysfunction and inflammation. These mechanisms are interdependent, modulated by genetic factors and comorbidities such as sleep-disordered breathing, left heart failure and pulmonary thromboembolism . [7]

Pulmonary vascular remodelling

Pulmonary vascular remodelling refers to the changes in the pulmonary vasculature that are associated with elevations in pulmonary vascular pressure. Chronic hypoxia is an important cause of pulmonary vascular remodelling and PH. This has been considered as the major mechanism leading to the development of PH in patients with lung disease. [8]

Pulmonary arteries are elastic type of arteries. Pulmonary circulation is a high-flow, low-resistance, low-pressure system. Pulmonary vascular remodelling is the characteristic feature of most forms of PH. [9] Extensive remodelling of the lung vasculature occurs sequentially and includes medial hypertrophy, muscularization of small arterioles, intimal thickening and the formation of plexiform lesions.

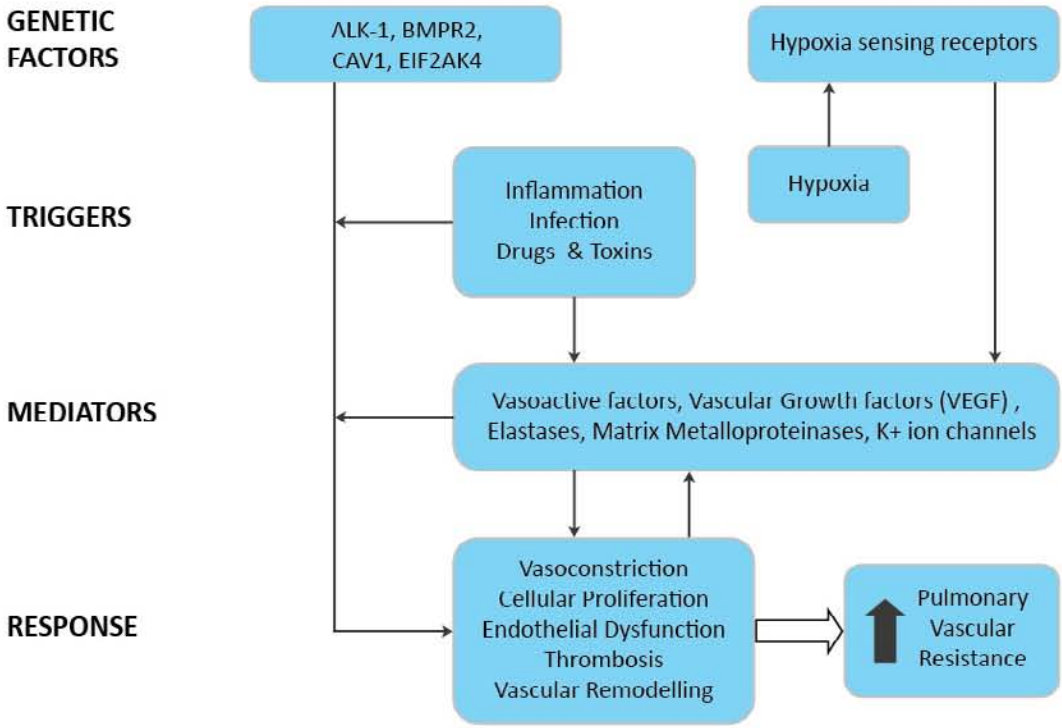

Figure 1. Pathogenesis of Pulmonary Hypertension

Summary

- Current understanding about the pathophysiology and natural history of PH continues to evolve.
- The role of chronic inflammation, autoimmunity, signalling in endothelial, smooth muscle, fibroblast, and inflammatory cells as well as molecular processes underlying small-vessel disease in PH is important and offers valuable scope for the development of newer specific drugs and other therapies for PH.

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Clinical Presentation, Diagnosis, Assessment and Monitoring of Pulmonary Hypertension

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Introduction

Pulmonary hypertension (PH) is a complex disease with multiple causes and characterized by non-specific signs and symptoms. Primary PH is a rare disease of unknown etiology, whereas secondary PH is a complication of many pulmonary, cardiac and extrathoracic conditions. Regardless of etiology, PH results in right-sided heart failure with a poor prognosis if diagnosis and treatment are delayed. Prompt diagnosis of PH with comprehensive evaluation, assessment and risk stratification is important to guide treatment.

Clinical Presentation

In general, the clinical features of PH are non-specific and overlap with many common chest diseases. Since PH is usually asymptomatic until severe, patients experience problematic delays in the time interval between onset of symptoms and appropriate diagnosis. Patients typically present with exertional dyspnea and fatigue that progress over time until severe PH with overt right ventricular failure develops. Patients with an underlying cause of PH may also reflect signs and symptoms of etiology like connective tissue disease, heart failure, chronic lung diseases like chronic obstructive pulmonary disease (COPD), interstitial lung disease (ILD), obstructive sleep apnea (OSA) and others. Symptoms due to PH are generally difficult to dissociate from symptoms of underlying pulmonary or cardiac disease. In idiopathic pulmonary arterial hypertension (IPAH), the first symptoms generally occur during exertion, usually dyspnea and less often chest pain, dizziness, syncope or palpitation. Cor pulmonale is enlargement of the right ventricle as a consequence of disorders of the respiratory system. It has been estimated that more than 20% patients have symptoms of PH for longer than two years before PH is recognized.

Risk Factors	Clinical Presentation		
	Pulmonary Hypertension		Right sided Heart Failure
	Non-specific Symptoms	Uncommon Symptoms	
• Younger adults (IPAH) • Overweight • Family history • Drugs (Cocaine, Fenfluramine, etc.) • High altitude • Thromboembolism • Underlying cardiac or pulmonary disease (COPD, ILD, OSA, others) • Lung transplant or Pulmonary resection	• Dyspnea • Cough • Chest Pain • Palpitation • Fatigue • Weakness • Light- headedness • Syncope • Diaphoresis	• Hemoptysis • Arrythmias • Ortner's syndrome (hoarseness due to left recurrent laryngeal nerve palsy caused by mechanical compression)	• Abdominal distension • Oedema • Ascites • Venous distension • Hyperdynamic right ventricular impulse • Splitting of second heart sound (S2) with loud pulmonary component (P2) • Gallop • Murmurs • Tricuspid or pulmonary insufficiency

Table 1. Risk Factors and Clinical Features of Pulmonary Hypertension

Evaluation & Assessment

After initial clinical examination patients have to be evaluated in order to establish the diagnosis of PH as well as assess severity, identify etiology, guide treatment and also inform the prognosis. Screening tests are also required to diagnose pre-clinical disease, however their use is restricted to patients at high risk of developing PH. Further investigations are guided by clinical suspicion and the results of preliminary investigations.

1. Chest Radiograph :

Patients with PH show evidence of cardiomegaly and dilated pulmonary arteries. Enlarged central pulmonary arteries with septal lines and normal sized chambers suggest possibility of pulmonary vascular disease. PH secondary to respiratory disease may show features of lung diseases and cor-pulmonale. Pulmonary venous hypertension should suggest the possibility of left heart disease or pulmonary veno-occlusive disease. Patients with chronic thromboembolic pulmonary hypertension (CTEPH) often show irregularly shaped and asymmetrically enlarged proximal vessels and regional differences in pulmonary vascularity.

2. Electrocardiogram (ECG) :

The 12 lead ECG is one of the first investigations performed. It reveals signs of right ventricular hypertrophy and atrial overload. There can be right axis deviation, a tall R and a small S wave with R/S >1 with typical QRS morphology (rsr', rsR', rSR', wide and notched R) in leads V1 or V2, a large S wave and a small R wave with R/S ratio <1 in lead V5 or V6, an S1S2S3 pattern (far right axis deviation with dominant S

waves in leads I, II and III) in right ventricular hypertrophy, a high amplitude (> 2.5mm) P-wave in leads II & V1 (P-pulmonale) in right atrial hypertrophy or S1Q3T3 pattern (large S wave in lead I, Q wave in lead III and an inverted T wave in lead III) in pulmonary thromboembolism and cor-pulmonale . Though ECG changes correlate well with a diagnosis of right ventricular hypertrophy, they are not very sensitive or specific for the diagnosis of pulmonary hypertension. Severe symptoms without prominent right ventricular hypertrophy should raise the possibility of CTEPH.[1]

3. 2-dimensional Echocardiography (2-D ECHO) :

Transthoracic Echocardiography (TTE) is the most important tool used to diagnose PH, as well as assess it's severity and prognostication. Echocardiographic evaluation includes the assessment of right and left ventricular size and function. ECHO can only suggest the presence of PH rather than diagnose as it doesn't measure pulmonary capillary wedge pressure (PCWP) or left heart pressure.TTE remains the best non-invasive tool to select which patient should undergo invasive cardiac catheterization which remains the gold standard. TTE evaluates the following:

- The presence of PH using the tricuspid regurgitant jet velocity (TRV). TRV can also be used to estimate the pulmonary artery systolic pressure (ePASP).
- The assessment of right ventricular (RV) size, wall thickness, and function
- The potential contribution of left-sided heart disease to PH .

In general, experts use a combination of the TRV and ePASP together with echocardiographic findings suggestive of RV hypertrophy/strain when evaluating the probability of PH. PH is suggested when the TRV is ≥2.8 m/s, the ePASP exceeds 35 mmHg in younger adults or 40 mmHg in older adults, and/or when RV size, wall thickness, and function are abnormal, understanding that PH may still be present even in the absence of these findings. Although estimation of the ePASP is practical and still used by many experts, ePASP may poorly correlate with values obtained by right heart catheterization (RHC) , which may be due to variability in the measurement of right atrial pressure (RAP) necessary for calculating ePASP. Regardless of whether TRV or ePASP is used, these values should always be interpreted together with clinical suspicion and signs of RV dysfunction to facilitate the decision about proceeding with additional testing for PH. Tricuspid regurgitation (TR) is commonly encountered in patients with PH. The ePASP can be calculated with Doppler echocardiography using the formula ePASP – [4 x $(TRV)^2$] + RAP. Notably, echocardiography may be less reliable in patients with severe emphysema.

4. Pulmonary function tests :

Several tests are appropriate to evaluate the presence of PH due to chronic lung disease and hypoxia. The most common tests initially performed include spirometry, advanced pulmonary function testing (PFT) and 6 minute walk test (6MWT). All PH patients should undergo spirometry and advanced PFT as part of the initial evaluation. Restrictive ventilatory defect and reduced diffusion capacity for carbon monoxide (DLCO) is noted in interstitial lung diseases as well as IPAH, whereas an obstructive ventilatory defect indicates COPD.

5. Chest high resolution computerized tomography (HRCT) :

Clues to underlying cause of PH apparent on the chest radiograph are better appreciated on chest HRCT, which also serves to distinguish group 3 (chronic lung disease) PH from group 1 (idiopathic) PH. Findings of reticular or nodular opacities may suggest interstitial lung disease (ILD), hyperinflation and bullae suggest obstructive lung disease, whereas normal lung fields suggest IPAH. Clues to non-pulmonary etiologies may also be evident on chest HRCT. Relative pulmonary arterial (PA) enlargement, defined as a PA to ascending aorta diameter ratio greater than 1 (PA:A > 1) is sensitive and specific for identifying patients with resting PH.

6. CT Pulmonary Angiography or Ventrilation/Perfusion (V/Q) scan :

The role of CT angiography in suspected CTEPH is well defined and findings include mosaic perfusion of the lung parenchyma and central pulmonary vessel enlargement accompanied by variation in the size of segmental vessels. In CTEPH, organised thrombi are often seen to line the larger pulmonary vessels in a concentric manner, distinguishable from the intraluminal filling defects seen in acute thromboembolic disease. Pulmonary angiography is advised to confirm or rule out treatable form of CTEPH. This procedure carries a significant risk in patients with a very high pulmonary arterial pressure but can usually be done safely, even in patients with right heart failure. An irregular intimal surface, rounded termination of segmental bronchus, luminal narrowing of central vessels and odd shaped pulmonary arteries all may indicate the presence of chronic pulmonary embolism. A normal or low-probability ventilation perfusion (V/Q) scan effectively excludes the diagnosis of CTEPH with high degree of sensitivity (90-100%) and specificity (94-100%).

7. Assessment for sleep-related breathing disorders :

Polysomnography (PSG) may be performed depending upon the clinical suspicion for sleep-related breathing disorders (SRBD) including obstructive sleep apnea (OSA). PSG may not be necessary if there is no clinical suspicion for SRBD and a sufficient explanation for PH is found. However, an SRBD should be excluded if a diagnosis of idiopathic PAH is being entertained.

8. Six minute walk test (6MWT) :

6MWT has several roles in diagnosis, assessment and monitoring of PH . It has several advantages in being an easily applicable, inexpensive, repeatable and a standardized test that is well tolerated by PH patients, apart from correlating well with symptoms, exercise capacity and markers of disease severity such as functional class and pulmonary hemodynamics. It is widely used in practice along with other tests to assess disease progression and response to treatment, apart from its prognostic value. It serves to assess exercise tolerance and is often used as the main clinical outcome in PH apart from being the primary end-point in several clinical trials conducted for efficacy and safety of new drugs for PH treatment. It measures the distance that a patient can quickly walk on a flat, hard surface in a period of 6 minutes (6MWD) and is often carried out in tandem with assessment of heart rate and oxygen saturation during the exercise (walking pulse oximetry). Oxygen desaturation (defined as a fall in $SpO_2 \geq 4\%$ or $SpO_2 < 90\%$) during 6MWT identifies underlying lung disease (e.g. COPD, ILD) with increased risk of morbidity and mortality. PH patients in World Health Organization Functional Class (WHO FC) III-IV have significantly lower 6MWD compared with patients in FC I-II. Although a 6MWD over 400 m is an acceptable value for many PAH patients, it has been reported that this may not be true for younger patients , who may be able to walk greater distances despite severe PAH. Although baseline 6 minute walk distance is a strong marker of prognosis in PAH, the magnitude of improvement in 6 minute walk distance (Δ6MWD) appears to have less significant impact on survival than reaching a threshold level of ~380 m on therapy.

Thus, we should be more concerned about a patient who improves baseline walk by 100 m and feels better yet only achieves a value of 250 m on therapy than the patient who improves by 25 m (from 370 to 395 m).[2] 6MWT should be performed at baseline and repeated 3-4 months after the beginning or modification of treatment and/or clinical worsening, in addition, regular monitoring should be performed every 3-6 months in stable patients.

9. Right Heart Catheterization (RHC) :
RHC is performed with the goal of confirming the diagnosis of PH and assessing the contribution of left-sided heart disease (LHD) and can be done safely in expert hands. Normal pulmonary capillary wedge pressures and left ventricular end-diastolic pressures rule out left heart disease. Indications for diagnostic RHC include:

- Patients with low probability of PH on echocardiography who have a clinical suspicion discordant with that finding.
- Patients with a moderate to high probability of PH on echocardiography in whom there is uncertainty regarding the contribution of LHD to PH .
- Patients in whom the severity of PH is discordant with , or not explained by severity of the underlying lung disease (eg. severe PH in patients with mild chronic lung disease).
- Patients in whom the etiology of PH remains undetermined after extensive non-invasive investigations (i.e. suspected idiopathic PAH).
- Patients in whom a strong component of pulmonary vascular disease (i.e. pre-capillary disease) is suspected.
- Patients in who mixed etiologies are suspected.

Acute vasoreactivity testing with vasodilators is indicated in patients of idiopathic, heritable or drug-induced PAH without heart failure to assess suitability for treatment with calcium channel blockers. Commonly used agents for vasoreactivity testing include epoprostenol infusion, adenosine infusion and nitric oxide inhalation. Vasodilator response is taken as positive when there occurs a reduction of the mean pulmonary arterial pressure (PAP) ≥ 10 mmHg to reach an absolute value of mean PAP ≤ 40 mmHg with an increased or unchanged cardiac output.

9. Other Tests : Magnetic resonance imaging (MRI) ,Cardio-Pulmonary Exercise Testing (CPET) , serological and biochemical tests are done in select cases.

Diagnosis

Accurate diagnosis of PH is a complex process, since initial clues from history tend to be non specific and physical signs subtle and variable, it requires great acumen on the part of the clinician. In many patients, the diagnosis of PH is made clinically using a constellation of clinical findings and non-invasive testing (e.g. PH that is explained by significant left heart disease or chronic lung disease). In contrast, other patients require hemodynamic diagnosis using right heart catheterization (e.g. patients with suspected IPAH). Hemodynamically, a mean pulmonary artery pressure (mPAP; supine and at rest) >20mmHg is now considered diagnostic of PH based upon data measuring mPAP in healthy individuals, which confirm that an mPAP of 8 to 20 mmHg at rest is normal. In addition, for patients with pre-capillary pulmonary hypertension (i.e. disease confined to the pulmonary arterial bed, such as patients with IPAH) the mPAP is no longer used in isolation but supplemented by an elevated pulmonary vascular resistance (PVR) of >3 Wood units to define PH. The diagnosis of PH due to chronic lung disease and/or hypoxemia is made by demonstration of PH on RHC or ECHO and evidence of moderate to severe lung dysfunction and/or hypoxemia in the absence of other causes of PH. Since treatment of PH varies with etiology, comprehensive patient assessment and risk stratification are important at the time of diagnosis in order to guide treatment decisions and monitor disease severity, progression as well as response to treatment. [3,4]

Assessment and Monitoring

Several parameters can be used to monitor patients with PH and estimate disease severity and progression at diagnosis and follow-up (Table 2). The first step is clinical assessment, including symptoms, signs of right ventricular (RV) failure, and rate of disease progression. The functional classification of PH according to the World Health Organization (modified after the New York Heart Association's classification) is of prognostic importance (Table 3) . World Health Organization Functional Class (WHO FC) is a powerful predictor of survival, with increasing numbers for WHO FC (I–IV) correlating with PH severity. Poor WHO FC status at presentation is associated with worse 5-year survival and improvements and deteriorations in WHO FC at follow-up have been associated with increases and decreases in survival rates respectively. Regular and comprehensive assessment at centres with expertise is recommended, since no variable alone provides sufficient diagnostic and prognostic information. [5]

Clinical Parameters	Exercise Capacity	Assessment of Right Ventricular Function			Biomarkers
		ECHO	RHC	Cardiac MRI	
• Symptoms (WHO FC) • Rate of progression • Signs of right ventricular failure • PH etiology	• 6MWD • CPET	• Right atrial pressure • PASP • Tei index • TAPSE • Right atrial area • Left ventricular eccentricity • Pericardial effusion	• Right atrial pressure • Cardiac Output • Cardiac index	• RV size & function • PA:A ratio • Cardiac output • Stroke volume	• BNP • NT-pro BNP • Troponins • Uric acid • Sodium

Table 2. Parameters and Tests to Assess and Monitor Pulmonary Hypertension

WHO Functional Class	Description
I	Patients with pulmonary hypertension but without resulting limitation of physical activity. Ordinary physical activity does not cause undue dyspnoea or fatigue, chest pain, or near syncope.
II	Patients with pulmonary hypertension resulting in slight limitation of physical activity. They are comfortable at rest. Ordinary physical activity causes undue dyspnoea or fatigue, chest pain, or near syncope.
III	Patients with pulmonary hypertension resulting in marked limitation of physical activity. They are comfortable at rest. Less than ordinary activity causes undue dyspnoea or fatigue, chest pain, or near syncope.
IV	Patients with pulmonary hypertension with inability to carry out any physical activity without symptoms. These patients manifest signs of right heart failure. Dyspnoea and/or fatigue may even be present at rest. Discomfort is increased by any physical activity.

Table 3. WHO Functional Classification of Pulmonary Hypertension.

Risk assessment forms an essential part of disease management in PH and should include a range of clinical, hemodynamic, and exercise parameters performed in a serial fashion over the course of diagnosis and treatment. Accurate risk assessment in PH allows physicians to determine the patient's prognosis, identify treatment goals, ascertain symptom and disease progression and the patient's response to treatment during follow up visits as well as guide treatment modifications . Risk stratification can also help physicians allocate treatment resources more efficiently in settings where they are scarce as well as enhance the consistency of treatment practices and improve the timeliness of referral for lung transplantation.

Right ventricular (RV) dysfunction is a key indicator of disease progression in PH. Right ventricular function is defined by the complex interplay between contractility, afterload, compliance and heart rate. Since there exists no single parameter that can directly measure key determinants of RV function, it is estimated using hemodynamic variables, ECHO, RHC, cardiac magnetic resonance imaging (CMRI) and biomarker analysis. RHC is the gold standard for assessing severity and records a range of variables that impact prognosis. Interestingly, the right atrial pressure rather than pulmonary pressure has been found to influence outcome. ECHO remains a precious tool to approach the right ventricle non-invasively. The degree of tricuspid annular displacement is reflected in the tricuspid annular plane systolic excursion (TAPSE) and is an indirect marker of RV systolic function and contractility. TAPSE < 1.8 cm is associated with greater RV systolic dysfunction and poorer prognosis. The myocardial performance or Tei index (isovolumic contraction time plus isovolumic relaxation time divided by ejection time) represents an estimate of global RV performance unaffected by geometry. Tei index increases as RV dysfunction progresses and a Tei index ≥ 0.98 was found to be a predictor of mortality. However, both TAPSE and Tei index are influenced by preload and the degree of tricuspid regurgitation which limits their use in clinical practice. Cardiac MRI provides better evaluation of RV size and function compared with ECHO besides permitting non- invasive assessment of cardiac output and stroke volume. A median stroke volume ≤ 25 mL/m², RV end-diastolic volume ≥ 84 mL/m² and LV end-diastolic volume ≤ 40 mL/m² were found to be independent predictors of poor prognosis in patients of IPAH. A PA:A ratio > 1 was also found to be associated with an increased risk of mortality particularly in patients of PH with moderate to severe COPD.

Biochemical markers add to the basket of non-invasive modalities for assessment and monitoring of RV dysfunction in patients with PH. Elevated levels of B-type (brain) natriuretic peptide (BNP), N-terminal pro B-type natriuretic peptide (NT-proBNP), troponins and uric acid all have been shown to correlate with poor prognosis in PH. [5]

Summary

- PH is a complex disease of highly diverse etiology with clinical features that are often subtle and non-specific.
- PH should be suspected in patients with a causative etiology who present with increasing dyspnea on exertion.
- Echocardiography with Doppler flow studies is the most useful initial imaging modality in patients with suspected PH.
- Further evaluation may include assessment of oxygenation and exercise capacity, pulmonary function testing, thoracic imaging and cardiac catheterization.
- The ability of current modalities for diagnosis and assessment of PH, and their possible limitations should be taken into consideration in the development of future modalities.
- It is important to consider risk assessment and monitoring of PH in conjunction with the patient's current treatment as it provides the framework for continuous fine-tuning of treatment strategies in order to achieve the best outcome.

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Treatment of Pulmonary Hypertension

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Introduction

Therapy for pulmonary hypertension (PH) has progressively evolved over the past decade, increasing in complexity and evidence for efficacy. PH treatment cannot be considered a mere prescription of drugs, but is characterized by a complex strategy that includes initial evaluation of severity and subsequent response to treatment.

Treatment approach

The clinical classification of PH is intended to categorize multiple etiologies into five groups according to their similar clinical presentation, pathological findings, hemodynamic characteristics and treatment strategy. Current treatment strategies for PH can be categorized into three main groups, step-by-step as follows :

(1) General measures : Initial approach includes general measures (physical activity and supervised rehabilitation, pregnancy, birth control and post-menopausal hormonal therapy, elective surgery, infection prevention through vaccination, psychosocial support, adherence to treatment, genetic counselling and travel advisories), supportive therapy (oral anticoagulants, diuretics, digoxin and oxygen supplementation) according to clinical condition and underlying etiology, referral to expert centres and acute vasoreactivity testing for calcium channel blocker (CCB) therapy.

Patients with PH need advice about activities of daily living and need to adapt to the uncertainty associated with this serious chronic life threatening disease. The diagnosis of PH usually confers a degree of social isolation. Encouraging patients and family members to join PH patient support groups can have positive effects on coping, confidence and outlook.

Pregnancy in PH remains associated with substantial mortality. However, a recent report indicates that the outcome of pregnancies in PH has improved, at least when PH is well controlled and particularly in long-term responders to CCB's. There is less consensus regarding the most appropriate method of birth control. Barrier contraceptives are safe for the patient, but with unpredictable effects. PH patients who become pregnant should be informed of the high risk of pregnancy and the option of termination should be discussed. Those who choose to continue pregnancy should be treated with disease-targeted (PH specific) therapies along with planned elective delivery with close effective joint collaboration between the obstetrician and the physician. The efficacy of hormonal therapy in postmenopausal women with PH is unclear, however it may be considered in conjunction with oral anticoagulation when menopausal symptoms are severe.

Oral anticoagulants

There is a high prevalence of vascular thrombotic lesions at postmortem examinations of patients with idiopathic pulmonary arterial hypertension (IPAH). Abnormalities in coagulation and fibrinolytic pathways have also been reported. This, together with the non-specific increased risk factors for venous thromboembolism, including heart failure and immobility, represent the rationale for oral anticoagulation in pulmonary arterial hypertension (PAH) and chronic thromboembolic pulmonary hypertension (CTEPH).

Diuretics

Decompensated right heart failure leads to fluid retention, raised central venous pressure, hepatic congestion, peripheral edema and ascites. Although there exists little evidence to support the use of diuretics in PH, clinical experience shows symptomatic benefits in fluid overloaded patients treated with this therapy.

Oxygen (O_2)

Although O_2 administration has been demonstrated to reduce pulmonary vascular resistance in PH, there is no data from randomized controlled trials (RCTs) to suggest benefits with long-term O_2 therapy (LTOT). Most patients with PH, except those with congenital heart diseases and pulmonary-systemic shunts, have minor degrees of arterial hypoxemia at rest unless they have a patent foramen ovale. Nocturnal O_2 therapy does not modify the natural history of advanced Eisenmenger syndrome.

Digoxin and other cardiovascular drugs

Digoxin has been shown to improve cardiac output acutely in IPAH, although its efficacy on long-term use is unknown. It may be given to control the ventricular rate in PH patients with atrial tachyarrhythmias. Not much data exists regarding the efficacy and safety of angiotensin-converting enzyme inhibitors (ACEI), angiotensin-II receptor antagonists (ARB), beta-blockers or ivabradine in PH.

(2) Pharmacotherapy : The second step includes initial therapy with high-dose CCB in vasoreactive patients or drugs approved for PH in non-vasoreactive patients according to the prognosis of the patient, the level of evidence and the grade of recommendation for each drug, either individually or in combination.

Calcium channel blockers (CCBs)

It is recognised that only a small number of patients with IPAH who demonstrate a favourable response to acute vasodilator reactivity testing during right heart catheterization do well with CCBs. The CCBs that have been predominantly used in reported studies are nifedipine, diltiazem and amlodipine, with particular emphasis on nifedipine and diltiazem. The choice of CCB is based on the patient's heart rate at baseline, with a relative bradycardia favouring nifedipine and amlodipine and a relative tachycardia favouring diltiazem. The daily doses of these drugs in IPAH are relatively high : 120 - 240 mg for nifedipine, 240 - 720 mg for diltiazem and up to 20 mg for amlodipine. Patients with IPAH with a positive vasodilator response and are treated with CCBs should be followed-up closely for both efficacy and safety, with complete reassessment (RHC) after 3–4 months of therapy. If the patient does not show adequate response, defined as being in WHO-FC I or II and with marked hemodynamic improvement (near normalization), additional PH therapy with pressure lowering agents (see Table 1) should be considered. In some cases the combination of CCB with other PH drugs is required because of further clinical deterioration with CCB withdrawal.

Class	Drug	Route of Administration	Dose
Prostacyclin derivatives	Epoprostenol	IV infusion	2 ng/kg/min ; increase as tolerated by increments of 1-2 ng/kg/min at 15 minute intervals
	Iloprost	Inhaled	2.5 or 5 µg 6 - 9 inhalations per day
	Treprostinil	Oral	0.25 mg bid or 0.125 mg tid Increase 0.125 mg bid every 3 - 4 days
		Inhaled	18 - 54 µg (3 - 9 inhalations) 4 times daily
		Subcutaneous or IV infusion	1.25 ng/kg/min; increase 1.25 ng/kg/min per week based on clinical response; after week 4 increase by 2.5 ng/kg/min per week based on clinical response
Prostacyclin receptor agonists	Selexipag	Oral	200 µg twice daily Increase in increments of 200 µg twice daily every week as tolerated to maximum dose of 1600 µg twice daily
Phosphodiesterase type- 5 (PDE5) inhibitors	Sildenafil	Oral or IV injection	20 mg every 8 h
	Tadalafil	Oral	40 mg once daily
Soluble guanylate cyclase (sGC) stimulators	Riociguat	Oral	0.5 - 1.0 mg every 8 h ; increase 0.5 mg every 2 weeks as tolerated to maximum dose 2.5 mg every 8 h
Endothelin receptor antagonists (ETRA)	Bosentan	Oral	62.5 mg twice daily ; after 4 weeks increase to 125 mg twice daily
	Ambrisentan	Oral	5 or 10 mg once daily
	Macitentan	Oral	10 mg once daily

Table 1. Currently Approved Medications for the Treatment of Pulmonary Hypertension

(3) Step-up therapy : The third step is largely related to response to the initial treatment strategy; in case of inadequate response, the role of treatment escalation by combinations of approved drugs comes into play. Atrial septostomy and lung transplantation are reserved for patients refractory to medical therapy.

Combination therapy - Using two or more classes of drugs simultaneously has been tried successfully in the treatment of systemic hypertension and heart failure. It is also an attractive option for the management of PH, as three separate signalling pathways known to be involved in pathogenesis can be addressed by specific drugs; namely the prostacyclin pathway (prostanoid agonists), the endothelin pathway (endothelin receptor antagonists) and the nitric oxide pathway (phosphodiesterase inhibitors , guanyl cyclines and nitric oxide). The experience with combination therapy is ever increasing and a recent meta-analysis of 6 randomized controlled trials (RCTs) with combination therapy including 858 patients revealed that when compared with the control group, combination therapy reduced the risk of clinical worsening {relative risk [RR] 0.48 [95% confidence interval (CI) 0.26, 0.91], p= 0.023}, increased the 6 minute walking distance (6MWD) significantly by 22 metres and reduced mean pulmonary arterial pressure(PAP), right atrial pressure (RAP) and pulmonary vascular resistance (PVR). The incidence of serious adverse events was similar in the two groups [RR 1.17 (95% CI 0.40, 3.42), p = 0.77]. The reduction in all-cause mortality was not statistically significant. However, the incidence of mortality in RCTs with PH medications is relatively low and to achieve statistical significance a sample size of several thousand patients may be required. Combination therapy may be applied sequentially or initially (upfront).

Additional Considerations

Pulmonary endarterectomy (PEA) is the treatment of choice for CTEPH. In contrast to surgical embolectomy for acute pulmonary embolism, treatment of CTEPH necessitates a true bilateral endarterectomy through the medial layer of the pulmonary arteries, which is performed under deep hypothermia and circulatory arrest, without the need for cerebral perfusion at expert centres.

Despite advances in medical therapy for PH, there still remain a significant number of patients who do not adequately respond to or are unable to tolerate maximally optimized medical therapy. For these patients, lung or heart-lung transplantation continues to be an important therapeutic option that provides substantial improvements in long term survival and quality of life. Current guidelines from the International Society for Heart and Lung Transplantation recommend early counseling about transplant and early referral to a transplant program to minimize risks of delay of timely listing for transplantation for potential candidates.

Bilateral lung transplant is the most common transplant procedure for patients with PAH; however, heart-lung transplant may be required for patients with complex congenital heart disease and other considerations.[1,2]

PH Referral Centres

PH is an uncommon disease. Since centres with a high volume of patients tend to obtain better outcomes, the establishment of dedicated expert or referral centres for PH becomes desirable clinically as well as economically. PH referral centres should receive new referrals and undertake assessment and investigation of all causes and complications of PH, offer management with disease specific therapies, provide collaborative care by an interprofessional team and work closely with other healthcare providers in order to obtain the best outcomes for patients, in addition to undertaking audits, research and education. Centres should have a sufficient number of PH patients on therapy as well as new referrals to warrant this status. The ideal number of PH patients seen by an expert centre each year is recommended to be at least 200 for adult and about 30-50 for pediatric centres, with numbers adapted according to population distribution, geographical and other constraints, etc. It is recommended that a PH referral centre should follow at least 50 patients with PAH or CTEPH and receive at least two new referrals per month with documented PAH or CTEPH. [1]

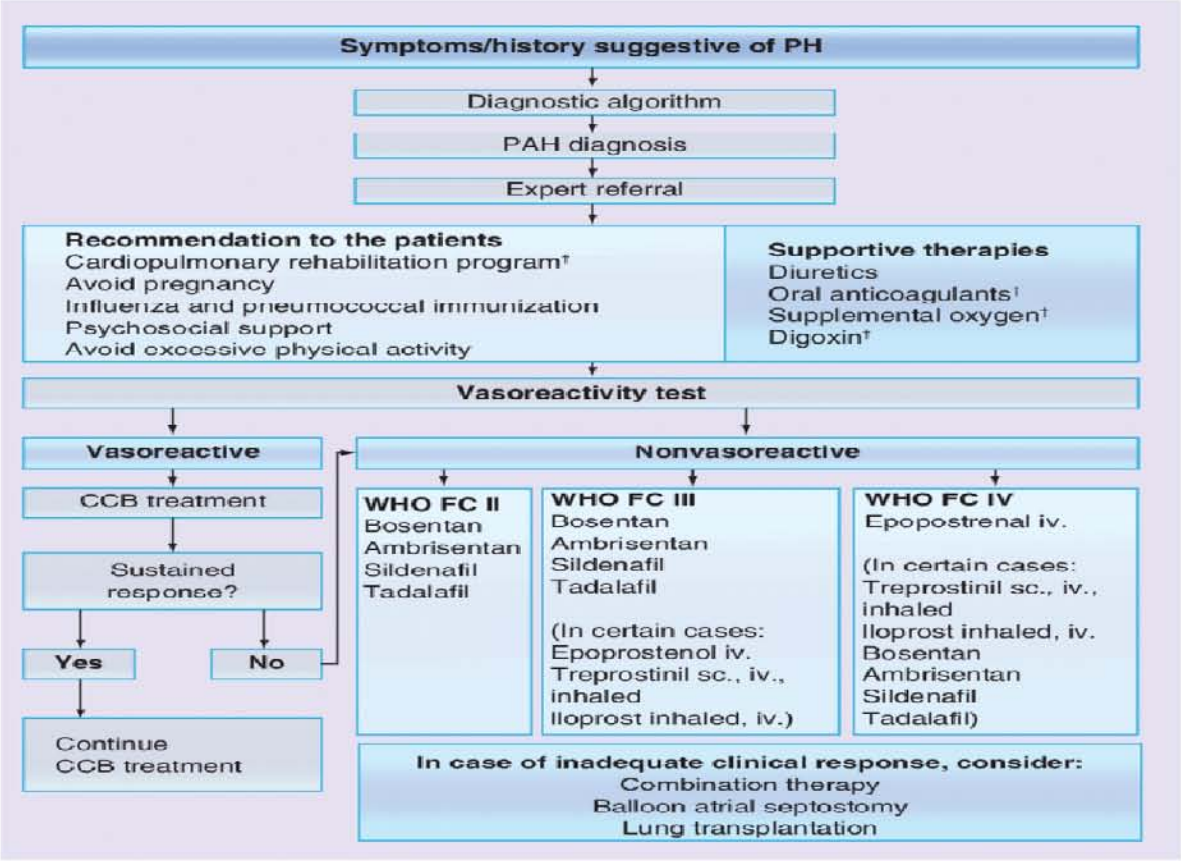

Figure 1. Treatment Approach towards Pulmonary Hypertension

Summary

- The wide range of treatment options for patients with PH continues to expand with advances in drug discovery and delivery, translational medicine and clinical research.
- General measures in the management of PH include immunization with polyvalent pneumococcal and seasonal influenza vaccines, oxygen supplementation, diuretics, digoxin, anticoagulation, avoidance or termination of pregnancy, supervised exercise and pulmonary rehabilitation and psychosocial support.
- PH specific drugs are categorized into four major classes, namely calcium channel blockers, phosphodiesterase inhibitors, endothelin receptor antagonists, and prostacyclin analogues.
- PH treatment should be individualized, with the decision to start any of the available therapies taken after thorough evaluation on a case-to-case basis in the appropriate clinical scenario.
- Wherever possible, every patient of PH should be offered referral to an expert centre and treatment in accordance with current evidence-based guidelines.[2]

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Pulmonary Hypertension in Chronic Obstructive Pulmonary Disease

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Case Report

A 65 year old male, ex-smoker, known case of Chronic Obstructive Pulmonary Disease (COPD) on therapy since five years without other comorbities presented to the emergency room with complaints of worsening breathlessness, easy fatigability, anasarca and oliguria since the last three days. The previous year had been exacerbation-free and his breathlessness had been well controlled on regular therapy with inhaled long acting beta adrenergic agonist (LABA) in combination with long acting muscarinic antagonist (LAMA). Clinical examination revealed an afebrile patient who was conscious, cooperative and well-oriented with pulse rate 102 beats/min, blood pressure 116/88 mmHg, respiratory rate of 24 cycles/minute and oxygen saturation 78% on room air, with facial puffiness, elevated jugular venous pressure and edema over both lower limbs (pitting) and the sacrum. Chest examination revealed bibasilar wheeze and crackles, right ventricular heave and S3 (ventricular) gallop. Baseline evaluation was planned as follows :

a) Chest radiograph - revealed hyperinflated lung fields, prominent central pulmonary artery markings with peripheral oligemia and vascular cephalisation and costophrenic angle blunting bilaterally (Figure 1)
b) Hemogram - revealed secondary polycythemia
c) Electrocardiogram (ECG) - revealed P pulmonale with right axis deviation
d) Arterial blood gases (ABG) - revealed hypoxia and hypercapnia with respiratory acidosis
e) Echocardiography (ECHO) - revealed normal ejection fraction with elevated right ventricular systolic pressure 35 mmHg. Doppler ultrasound of both lower limbs was normal.

Based on the above evaluation, a working diagnosis of acute exacerbation of COPD with pulmonary hypertension (PH), cor pulmonale and right heart failure was made and treatment initiated with oxygen supplementation at a flow rate 2 litres/minute, nebulization with levosalbutamol [short acting beta-adrenergic agonist (SABA)] and ipratropium [short acting muscarinic antagonist (SAMA)], diuretics and empiric broad spectrum antibiotics to prevent bacterial infection. Clinical improvement followed thereafter and the patient was further evaluated with computerized tomography (CT) of the chest which revealed features of emphysema and an enlarged mean pulmonary artery (MPA) with diameter of 3.6 cm (Figure 2). A phlebotomy was performed and the patient was discharged with advice for rest, continuation of inhaled LABA-LAMA combination therapy, a low salt diet and provision of domiciliary long-term oxygen therapy (LTOT) with plans for polyvalent pneumococcal and seasonal influenza vaccination and pulmonary rehabilitation on the next follow-up visit. Subsequent follow-up course over 4 months with compliance to LTOT was exacerbation-free and revealed therapeutic response in terms of clinical improvement, stabilization of lung function and resolution of polycythemia with normalization of hemoglobin and hematocrit .

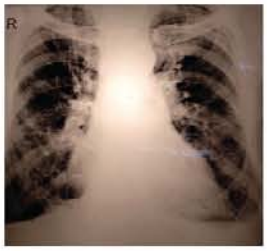

Figure 1. Chest Radiograph

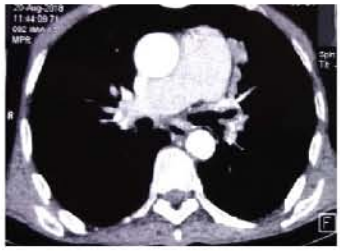

Figure 2. CT Chest

Discussion

PH in COPD falls in Group 3 PH (due to lung diseases and /or hypoxia). Group 3 is second most common cause of PH after Group 2. Typically mild-to- moderate mean pulmonary arterial pressures (mPAP) 25-35 mmHg are seen in patients with chronic lung diseases like COPD. PH in COPD often worsens during sleep, exercise and exacerbation and is associated with increased frequency of exacerbations and decreased survival. Pulmonary vascular remodeling in COPD is the main cause of increase in pulmonary artery pressure and is thought to result from the combined effects of hypoxia, inflammation and destruction of capillaries in severe emphysema. Patients with lung disease, hypoxemia and PH should receive long term oxygen and management of the underlying lung disease should be optimized. [1] The use of PH-specific drugs is not recommended in patients with PH due to lung disease, however, vasodilator therapy may be considered when severe PH is present in the setting of mild lung disease.

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Pulmonary Hypertension in Interstitial Lung Disease - A Clinico-Radiological Dissociation

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Case Report

A 70 year old male, retired clerk, presented with mild cough and exertional dyspnea of gradual onset and slow progression from grade I to IV (MRC) over 2 years. He was an ex-smoker with a 20 pack year smoking history. He had no history suggestive of environmental exposure and connective tissue disease. Clinical examination revealed a respiratory rate of 24 cycles/minute, an oxygen saturation of 89% on room air and bilateral basal fine end-inspiratory crackles. His chest radiograph revealed reticulation in the lower lung fields bilaterally. High resolution computerized tomography (HRCT) of the chest revealed bilateral basal subpleural honeycombing and traction bronchiectasis (Figure 1). Lung function revealed restrictive ventilatory defect with decreased diffusion capacity (Table 1). Serum anti-nuclear antibody (ANA) , rheumatoid factor and anti-cyclic citrullinated peptide antibody (anti-CCP) assays were negative. A diagnosis of idiopathic pulmonary fibrosis (IPF) was made based on clinico-radiological correlation and exclusion of other known factors. Treatment was initiated with Pirfenidone 600 mg/day gradually increased to 1800 mg/day, with partial improvement of symptoms. Follow-up lung function after 60 days revealed a decline with the diffusion defect being more pronounced than the forced vital capacity (Table 1). 2-Dimensional echocardiography revealed elevated pulmonary arterial pressure of 58 mmHg as estimated by Tricuspid jet regurgitation velocity. Right heart catheterization revealed severe pulmonary arterial hypertension with mean pulmonary artery pressure of 46 mmHg. Ambulatory oxygen along with Sildenafil tablet 20 mg twice daily were added to therapy. Subsequent follow-ups revealed therapeutic response in terms of symptom improvement and stabilization of lung functions.

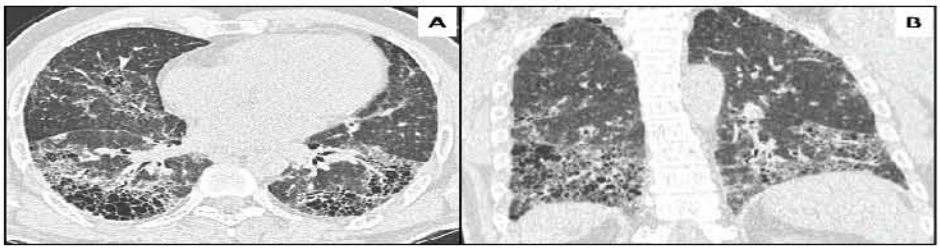

Figure 1. HRCT Chest - Bibasilar subpleural honeycombing and traction bronchiectasis in axial (A) and coronal sections (B)

Parameter	Baseline	Follow up at 60 days
FVC (L)	2.1	2.0
DLCO (%)	23%	21%
6MWT distance (m)	300	250
6MWT desaturation (%)	94% → 81%	91% → 79%

Table 1. Baseline and 60-day follow-up lung functions

[FVC: Forced Vital Capacity, DLCO: Diffusion Capacity for Carbon Monoxide, 6MWT: Six Minute Walk Test]

Discussion

Currently there exists no specific therapy for pulmonary hypertension in IPF or other interstitial lung diseases. The primary treatment comprises oxygen supplementation and anti-fibrotic agents. The Silfenafil Trial in Exercise Performance in Idiopathic Pulmonary Fibrosis (STEP-IPF) was conducted to assess the efficacy of Sildenafil in advanced IPF, however the primary end-point of distance covered in 6MWT was not met.[1] Moreover, right heart catheterization was not done in these cases. However, a post hoc analysis of a sub group revealed that Sildenafil improved exercise capacity and quality of life in patients of IPF with right ventricular systolic dysfunction.[2] Since our patient was clinically symptomatic with documented pulmonary hypertension on right heart catheterization, a trial of Sildenafil was offered. A careful review of clinical history, radiology and other investigations in cases of no or partial improvement in patients of interstitial lung diseases often helps in detecting comorbidities like pulmonary hypertension, the treatment of which improves symptomatology and quality of life.

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Pulmonary Hypertension in Obstructive Sleep Apnea

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Case Report

A 68 year old lady, known diabetic and hypertensive for more than a decade, presented to the pulmonary medicine OPD with complaints of breathlessness on exertion and fatigue for the last 2 years, with development of pedal edema during the last 6 months. A Cardiology assessment earlier led to her diagnosis and treatment as a case of recurrent cardiac failure with preserved ejection fraction. Medical history revealed severe snoring with witnessed apneas and excessive day time sleepiness. She was obese with body mass index 37 kg/m^2 and weight 89 kg and her pulse was 98 beats/min with blood pressure 160/80 mmHg and oxygen saturation 93% on room air. She was investigated with a chest radiograph (Figure 1 - normal), electrocardiogram, echocardiography, hemogram and thyroid stimulating hormone (TSH). Echocardiography showed normal left ventricular function, dilated right atrium and ventricle and severe pulmonary hypertension (PH) with a pulmonary arterial pressure of 39 mmHg.

To evaluate the etiology of PH in view of clinical suspicion of Obstructive Sleep Apnea (OSA), Arterial blood gases (ABG - normal), Spirometry (Figure 2 - normal) and Polysomnography (Figure 3 – revealed severe OSA with AHI 44/hr) were advised. She was prescribed titrated continuous positive airway pressure (CPAP) with monitoring. Subsequent follow-up visits revealed significant clinical (symptom) improvement along with reduction in pulmonary arterial pressure.

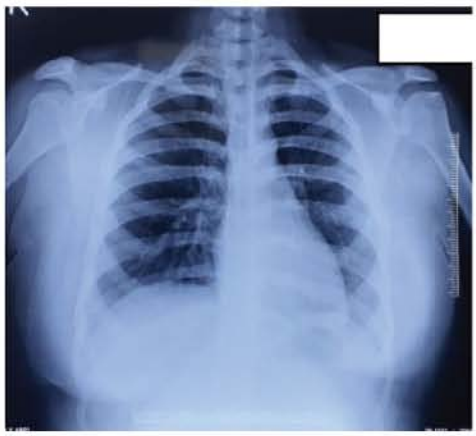

Figure 1. Chest Radiograph

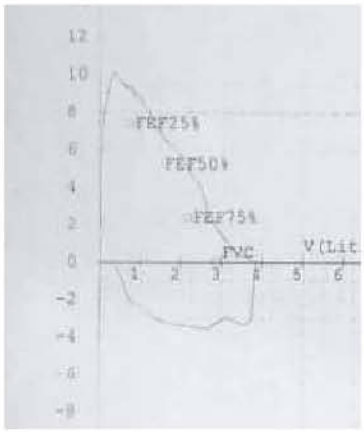

Figure 2. Spirometry Pattern

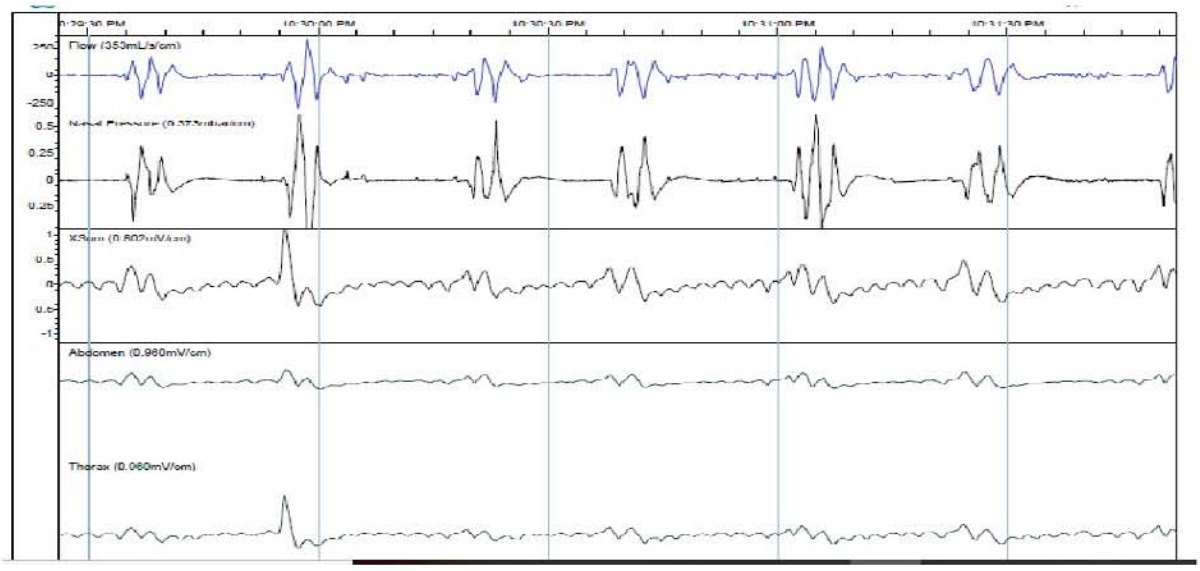

Figure 3. Polysomnography Epoch

Discussion

- The relation between OSA and PH is under research. Intermittent hypoxia caused due to repetitive episodes of apnea and hypopnea leads to polycythemia, thereby increasing pulmonary vascular resistance (PVR) and pressure. [1,2]
- PH is prevalent in about 20% of cases of OSA, with risk factors like obesity, hypoventilation, underlying lung diseases and several mechanisms that work in tandem (Figure 4).
- Associated back pressure changes occur particularly in the right ventricle to neutralize the rise in left ventricular end-diastolic pressure (LVEDP), increase in pulmonary vascular resistance and to maintain blood flow, which if imbalanced result in ventricular dilation, right heart failure and dyspnea. [2,3,4]
- On CPAP therapy, several clinical as well as hemodynamic parameters improve, including reduction in PVR and hypoxic pulmonary vascular reactivity. [4,5]
- Since patients of OSA who develop PH may present with symptoms of dyspnea and right heart failure, we need a high degree of suspicion and step-wise approach towards evaluation for prompt diagnosis and initiation of treatment.

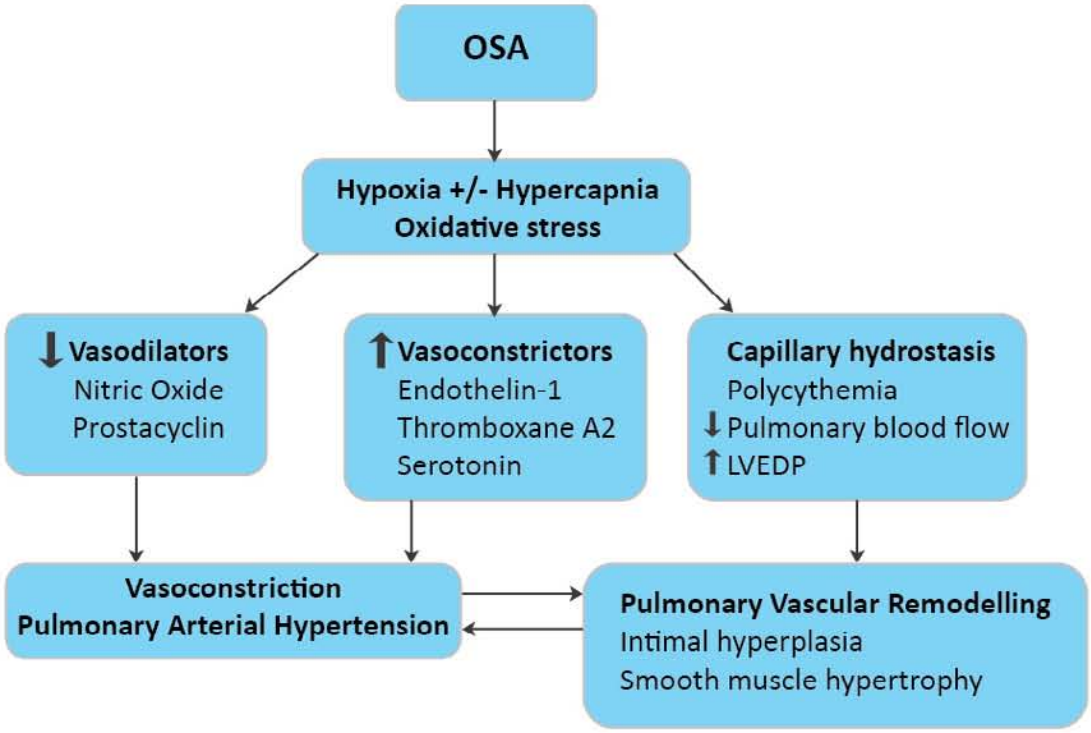

Figure 4. Pathogenesis of Pulmonary Hypertension in Obstructive Sleep Apnea

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Pulmonary Hypertension in the Intensive Care Unit and Chronic Thromboembolic Pulmonary Hypertension

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Case Report 1 – Pulmonary Hypertension with Acute Presentation in the Intensive Care Unit

A 32 year male office assistant presented to our emergency department after an episode of syncope. Prior to this he had been in good health with no history of disease. He had been swimming at a nearby location and collapsed suddenly while standing, with loss of consciousness for two minutes. Spontaneous recovery followed, but the patient remained tachycardic and apprehensive. He denied any associated chest pain or breathlessness. No seizure-like activity was witnessed, and he experienced no incontinence.

As mentioned before, he was employed as an office assistant and had to sit on the job for about 8 hours daily with hardly any rest in between. Examination revealed a conscious, cooperative and well oriented patient with pulse rate 120 beats/min, blood pressure 90/60 mmHg and oxygen saturation 96% on room air. Electrocardiogram (ECG) revealed sinus tachycardia with T-wave inversions in leads V1-V2. Chest radiograph and computerized tomography (CT) of the brain were normal. Echocardiography (ECHO) revealed dilated right atrium and right ventricle along with an enlarged pulmonary trunk, moderate tricuspid regurgitation and severe pulmonary arterial hypertension (PAH) with mean pulmonary arterial pressure 64 mmHg and normal ejection fraction consistent with a clinical suspicion of high risk acute pulmonary thromboembolism (PTE), for which an immediate computerized tomography pulmonary angiogram (CTPA) was advised. However, on arrival in the CT scan unit he suffered a sudden cardiac arrest on table. Cardiopulmonary resuscitation (CPR) was immediately commenced and code announced. Initial cardiac rhythm was recorded as pulseless electrical activity (PEA). After confirming correct placement of an endotracheal (ET) tube, thrombolysis was initiated with Alteplase 100 mg (10 mg over 10 minutes, followed by 90 mg over 2 hours) whilst high quality CPR was continued. Return of spontaneous circulation (ROSC) was achieved approximately 40 minutes later. As the patient was already in the CT room, it was decided to proceed with CTPA with the patient on alteplase infusion. CTPA revealed a large thrombus at bifurcation (saddle thrombus) and multiple large filling defects in both main pulmonary arteries as well as regions of pulmonary oligemia, thereby confirming the diagnosis of PTE (Figure 1).

The patient again lapsed into unconsciousness with nil urine output and was shifted to the intensive care unit (ICU) for continuous monitoring of vital signs and fluid resuscitation with inotropic support. On Day 2, he regained consciousness while maintaining optimal urine output. Lower limb venous doppler revealed left distal deep vein thrombosis (DVT) which was not clinically evident. On Day 3 our patient had low hemoglobin with black stools, necessitating transfusion with 8 units of packed red blood cells (PRBC) over the next 3 days. As bleeding stopped and hemoglobin levels rose, he was extubated after 5 days and a repeat echocardiography revealed reduction in right ventricular size (reversal of hypertrophy) and pulmonary arterial pressure. After a 16-day course in the hospital, he was discharged on oral anticoagulant therapy. Assessment on long term follow-up visits revealed clinical improvement, with no recurrence of either syncope or pulmonary embolism.

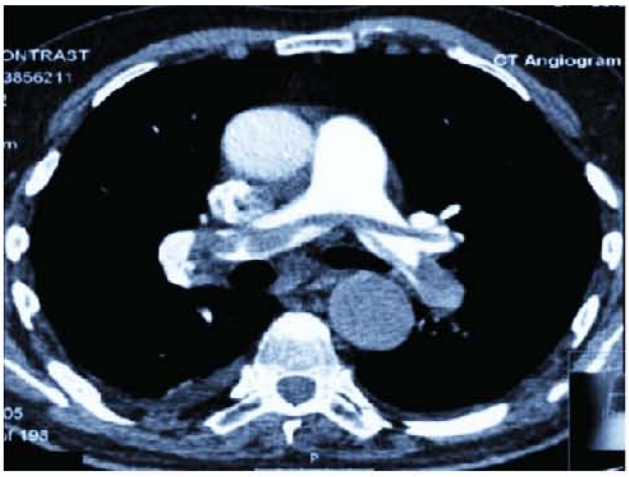

Figure 1. CT Pulmonary Angiography

Discussion

- Pulmonary Embolism presenting with syncope is difficult to diagnose as a cause of Pulmonary Hypertension in the ICU.
- Following clues suggest the diagnosis of pulmonary embolism in patients with a syncopal episode :
  (a) Hypotension and tachycardia or transient bradyarrhythmia.
  (b) Features of right ventricular failure or cor pulmonale on ECG or clinical examination.
  (c) Signs or symptoms suggestive of DVT and/or pulmonary embolism.
- High quality chest compressions, early defibrillation and correction of the underlying cause of cardiac arrest are the only three interventions that have been shown to improve outcomes in patients with cardiac arrest.
- Thrombolysis leads to rapid reduction in angiographic clot burden and pulmonary hypertension, restores right ventricular function and reduces the risk of recurrent pulmonary emboli. [1]
- In PE survivors with unexplained or persistent exertional dyspnoea, chronic thromboembolic pulmonary hypertension (CTEPH) should be considered. [2] A history of acute pulmonary embolism was reported for 74.8% of CTEPH patients from the international CTEPH registry. [3]

Case Report 2 – Chronic Thromboembolic Pulmonary Hypertension

A 48 year old presented with progressive exertional breathlessness over a year's duration with World Health Organization (WHO) Functional Class III symptoms. Medical history revealed ischemic heart disease and 3rd degree heart block, treated with percutaneous transluminal coronary angioplasty (PTCA) along with pacemaker implantation 2 years ago. The patient was an ex smoker with smoking history of 10 pack years and quit smoking after PTCA. Previous evaluation revealed an echocardiography (ECHO) suggesting pulmonary hypertension (PH) with a right ventricular systolic pressure (RVSP) of 45 mmHg and normal ejection fraction, spirometry suggestive of mild obstructive defect and a normal chest radiograph. With a clinical background suggestive of chronic obstructive pulmonary disease (COPD), he was previously prescribed inhaled long acting beta adrenergic agonist (LABA) in combination with long acting muscarinic antagonist (LAMA) by his physician with partial symptom relief initially but without improvement since the last 2 months. He was referred to our centre for further evaluation of his breathlessness.

Examination revealed a dyspneic patient too breathless to perform spirometry satisfactorily, with baseline oxygen saturation 97% on room air at rest falling further to 88% on mild exertion. Chest radiograph was consistent with past medical history. He was evaluated further to ascertain the cause of breathlessness. Investigations revealed polycythemia (hemoglobin 17.4 g/dL) and elevated brain natriuretic peptide (BNP) level of 1850 pg/ml. Computerised tomography pulmonary angiography (CTPA) for pulmonary embolism was negative. A lung ventilation/perfusion (V/Q) scan was performed which revealed large mismatched perfusion defects, thereby confirming the diagnosis of chronic thromboembolic pulmonary hypertension (CTEPH). Anticoagulant therapy (nicoumalone) along with ambrisentan and tadalafil were prescribed along with referral to a specialist centre for pulmonary endarterectomy (PEA), which was successful. Post-discharge, the patient remains clinically stable with functional improvement on subsequent follow-up visits.

Discussion

What is the learning point from this case ?

The learning point from this case is that the original history was partly misinterpreted and while investigations demonstrated ischemic heart disease and COPD, pulmonary arterial hypertension (PAH) was not considered initially.

What are the predisposing factors and clinical features of CTEPH ? How is CTEPH diagnosed ?

CTEPH patients present with progressive exertional dyspnea and fatigue. CTEPH should be considered in all patients with unexplained PH. [2,4] Pulmonary embolism and deep vein thrombosis are the commonest causes of CTEPH and are reported in the medical history of 74.8% and 56.1% CTEPH patients respectively. [3,5] Other risk factors include the presence of a ventriculo-atrial shunt, indwelling leads and catheters (such as pacemakers or automated implantable cardiac defibrillator leads and chronic dialysis catheters), splenectomy, thyroid replacement therapy, inflammatory bowel disease and a history of malignancy.[5] The diagnosis of CTEPH is based on findings of PH obtained after at least 3 months of effective anticoagulation in order to differentiate it from subacute PE.[2]

What is the treatment for CTEPH ?

Anticoagulation is prescribed in all patients with CTEPH to prevent in situ pulmonary artery thrombosis and recurrent venous thrombo-embolism and is often continued lifelong . CTEPH is considered a two compartment (proximal and distal) disease, with initial occlusion of the proximal major pulmonary vessels by fibrotic material as a consequence of non-resolution of a single or recurrent pulmonary embolism and accompanied by distal pulmonary arteriopathy and microvascular disease in the non-obstructed areas (Figure 2). The proximal obstructions are suitable for PEA, the potentially curative treatment which relieves pulmonary artery obstruction, reduces pulmonary vascular resistance and alleviates right ventricular dysfunction. Medical treatment with specific PAH therapies is also used as a bridge to PEA.[6] Surgical candidates should be referred to an expert centre once the diagnosis of CTEPH is confirmed.

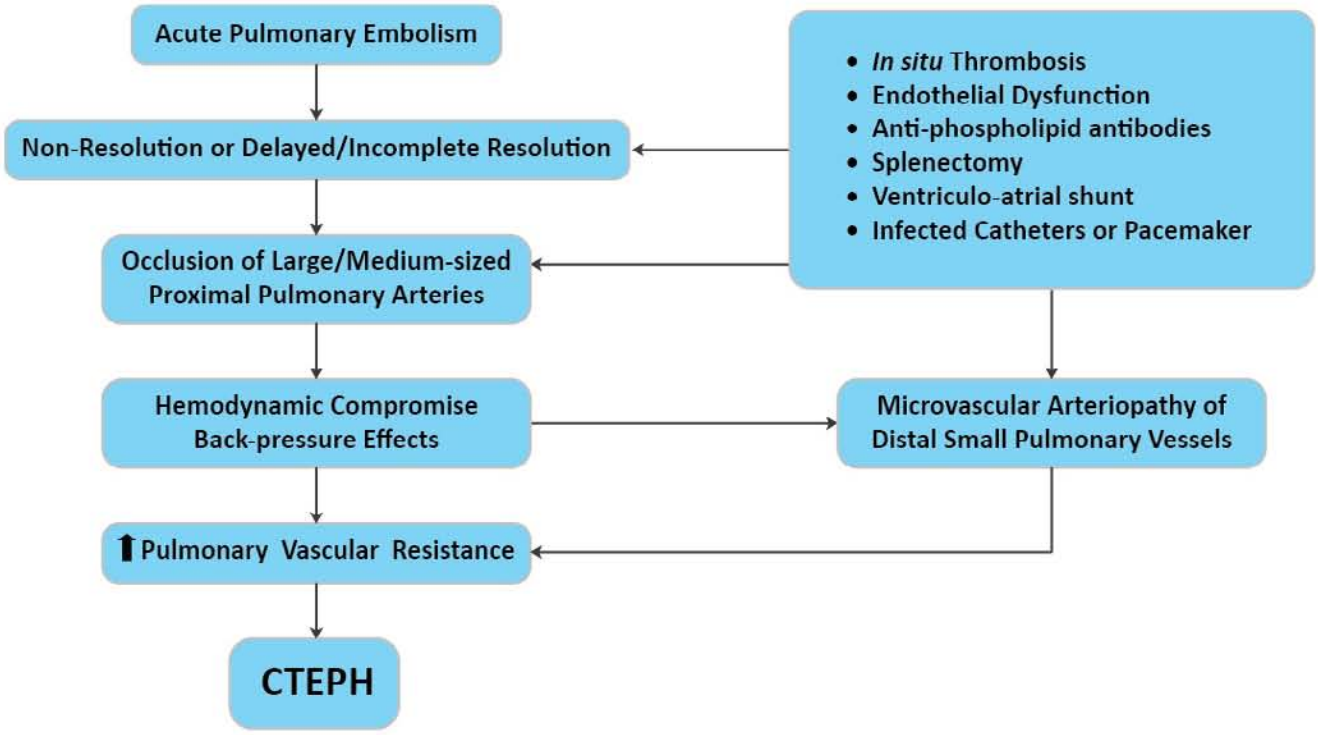

Figure 2. Pathogenesis of Pulmonary Hypertension in Acute PE and CTEPH

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Pulmonary Hypertension in Pregnancy

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Case Report

A 28 year old pregnant housewife, married since three years was referred to our institute during the thirtieth week of gestation for evaluation of unexplained exertional breathlessness. Breathlessness had been persistent since the last four years, conspicuous only on strenuous activity for the initial two years but progressively worsened after her first pregnancy (two years ago) which had terminated in a spontaneous abortion during the tenth week of gestation. Since the last three months she had become increasingly dyspneic, with her breathlessness progressing from World Health Organization Functional Class (WHO-FC) I to II. She also complained of easy fatigability, palpitations and occasional central chest pain. Cough, hemoptysis, wheezing, syncopal attacks and pedal edema were absent. Medical history was negative for respiratory, cardiac and auto-immune/connective tissue disorders; and addiction to smoking, illicit drug or substance abuse. Physical examination revealed a well built pregnant lady with body mass index 27.8 kg/m^2, tachycardia with heart rate 124 beats/min, blood pressure 100/60 mmHg, tachypnea with respiratory rate 28 cycles/min and oxygen saturation 94% on room air. General physical examination was otherwise unremarkable. Chest examination revealed an accentuated pulmonary component of the second heart sound and a pan-systolic murmur, strongly suggestive of tricuspid regurgitation (TR).

Further evaluation was advised to identify the etiology of breathlessness. Hemogram, liver and kidney function and urine microscopy were within normal limits. Serology was non reactive for HIV, HbsAg and HCV. Serum anti nuclear antibody (ANA), rheumatoid factor and anti-cyclic citrullinated peptide antibody (anti-CCP) assays were negative and a rheumatologic evaluation did not suggest presence of an auto-immune/connective tissue disorder clinically. Chest radiograph (with abdominal shield) revealed marked cardiomegaly with prominent pulmonary conus and enlarged pulmonary arteries with perihilar vascularity (Figure 1). Spirometry was normal and arterial blood gas (ABG) analysis did not reveal hypoxia or hypercapnia. Echocardiography revealed dilated right atrium (RA) and ventricle (RV) with flattening of the inter-ventricular septum (IVS), normal left atrial (LA) and left ventricular (LV) size, function and ejection fraction, moderate tricuspid regurgitation and severe pulmonary hypertension (PH) (right ventricular systolic pressure RVSP of 54 mmHg) with no evidence of intra-cardiac shunts or congenital heart defects (Figure 2). Abdominal ultrasound revealed a viable fetus with minimal growth lag. 6 minute walk distance was 300 meters without significant desaturation and serum brain natriuretic peptide (BNP) level was 100 pg/mL. Further evaluation with thoracic computerized tomography (CT), advanced pulmonary function tests including diffusion capacity for carbon monoxide (DLCO) and right heart catheterization (RHC) was avoided due to advanced pregnancy.

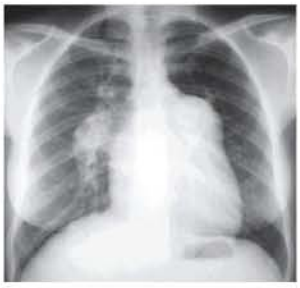

Figure 1. Chest Radiograph with abdominal shield

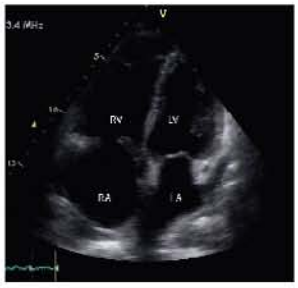

Figure 2. Echocardiography

A diagnosis of Severe PH (Group I) WHO-FC II with pregnancy (G2P1L0A1; 30 weeks+) with low-to-intermediate risk was made based on the results of evaluation supported by the exclusion of other etiologies.[1] In accordance with clinical practice guidelines and standards of care, the patient was explained about her diagnosis and counseled regarding the clinical course and risks including maternal and fetal prognosis, however she declined immediate medical termination of pregnancy and insisted on treatment along with her pregnant status, with conditional consent for early termination subject to clinical deterioration or after attaining sufficient fetal maturity.

In view of advanced pregnancy, she was hospitalized and treated with adequate rest, semi-recumbent left lateral positioning, thromboprophylaxis with low molecular weight heparin (LMWH), low dose diuretics and PH-specific therapy of sildenafil tablet 25 mg thrice daily, along with close monitoring of vital parameters, fluid intake and urine output as well as adverse effects like hypotension, flushing, headache, syncopal attacks and palpitation. Regular bed-side echocardiography and ultrasonic fetal monitoring were performed. Clinical stabilization was noted within two weeks.

After attaining sufficient fetal maturity at 33+ weeks of gestation, delivery was facilitated by an elective lower segment caesarean section (LSCS) under general anaesthesia, resulting in the birth of a live baby girl with birth weight 2.2 kg, who was transferred and managed in the neonatal care unit, the entire procedure being uneventful and without immediate post-partum complications. Gradual recovery followed over the next 4 weeks with clinical improvement (WHO-FC I). She was advised to continue therapy with sildenafil along with an oral anti-coagulant (low dose warfarin) and discharged with advice for rest, contraception and regular out-patient follow-up after 3 weeks, with plans for polyvalent pneumococcal and seasonal influenza vaccination.

Discussion

- PH often affects women of childbearing age, with poor maternal (30-56%) and fetal (11-28%) outcomes reported during pregnancy.
- Females diagnosed with PH who become pregnant (or in whom PH is detected during pregnancy) should be explained the risks associated with pregnancy and counseled to consider timely therapeutic abortion.
- Those who choose to continue with pregnancy should be offered treatment (or continuation of treatment) with PH specific therapies, with the exception of endothelin receptor antagonists, preferably at specialized and experienced PH centres.[2]
- Pre-term labor is common in pregnant patients with PH, however natural labor should best be avoided.
- Patients should also be informed that PH might worsen during the post-partum period, with the highest risk of mortality during the first 4 weeks after delivery.

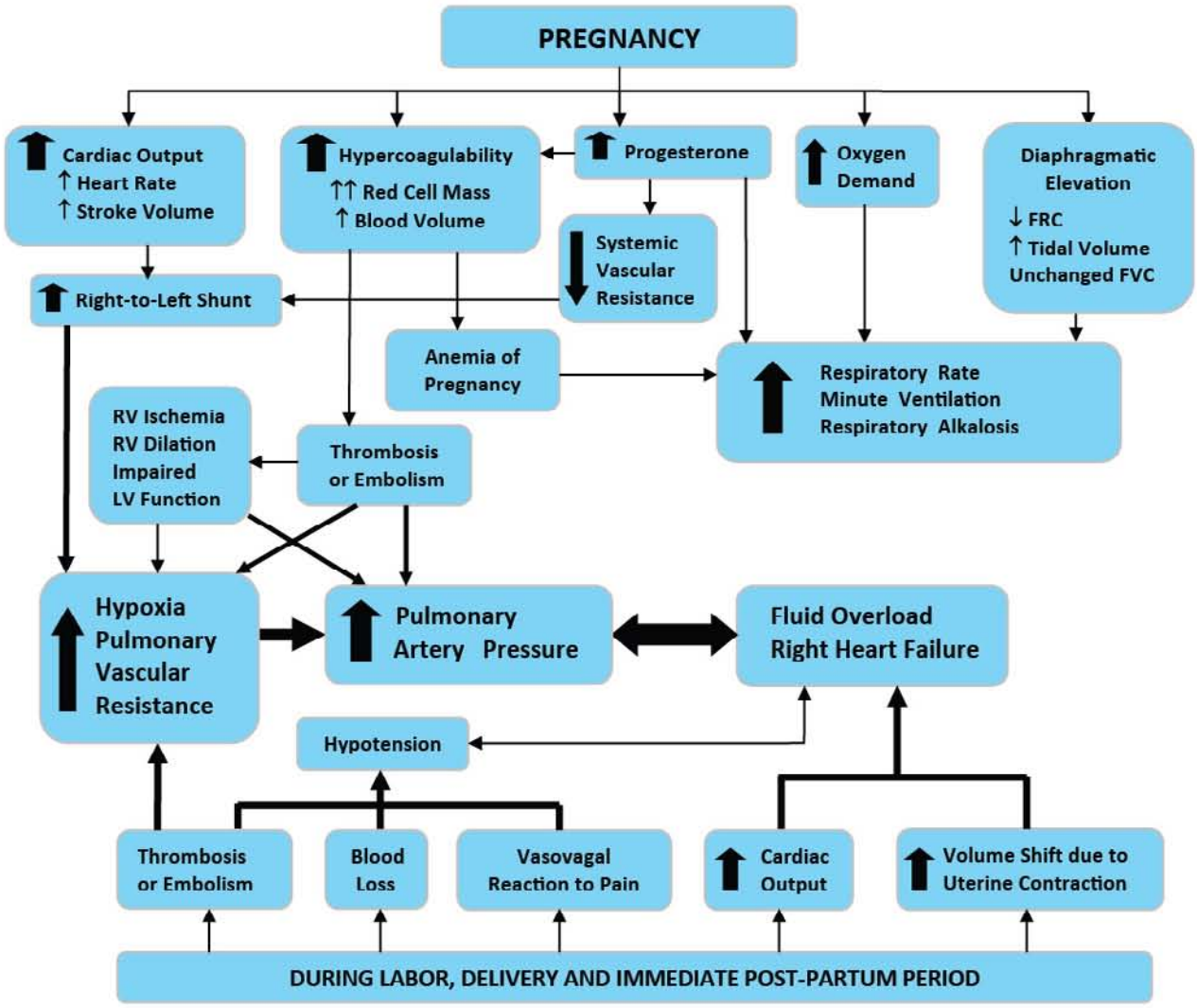

Figure 3. Pathophysiological Changes leading to Worsening of Pulmonary Hypertension in Pregnancy

[RV: Right Ventricular ; LV: Left Ventricular ; FRC: Functional Residual Capacity ; FVC: Forced Vital Capacity]

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Lung Transplant in Pulmonary Hypertension

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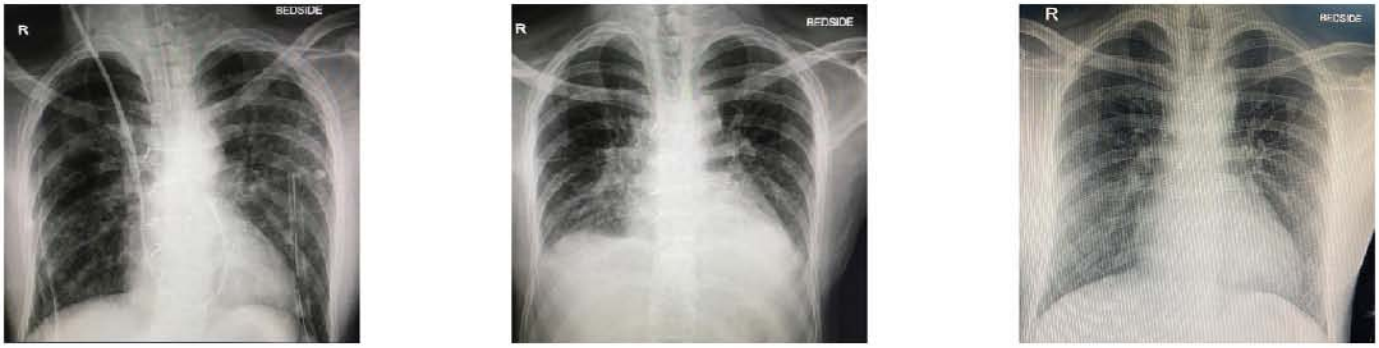
Case Report

A 25 year old male, known case of severe pulmonary hypertension, presented to our institute for lung transplant assessment. Evaluation (including Echocardiography) revealed a large 23mm mal-aligned subaortic ventricular septal defect (VSD) with aortic override and outlet extension, mild tricuspid regurgitation and severe pulmonary hypertension (PH) , dilated right atrium and right ventricle with fair right ventricular function, tricuspid annular plane systolic excursion (TAPSE) 19 mm and 6 minute walk distance of 340 metres with oxygen desaturation to 79% at room air. High resolution computerized tomography (HRCT) of the chest revealed mosaic attenuation with increased ratio of the pulmonary artery to ascending aorta diameters (PA:A ratio >1) suggestive of pulmonary hypertension. He underwent an ABO matched bilateral sequential lung transplant successfully. Post transplant he was extubated on Day 1, mobilized on Day 2 and discharged with satisfactory recovery on Day 13, with regular follow-up, which till date (9 months post-transplant) has been satisfactory and without complications.



(A) (B) (C)

Figure 1 - Chest Radiograph A - Immediate Post-transplant B - At Discharge C - Follow-up at 9 months

Discussion

Why refer for lung transplant ?

Pulmonary hypertension portends poor prognosis in patients ultimately leading to death due to right heart failure.[1] Though targeted therapies have improved the outlook for PH patients, those in World Health Organization Functional Class (WHO FC) III - IV have high mortality.[2] Prior to availability of lung transplant the median survival for PH was only 2.8 years. [3] Lung transplant emerged as a treatment for patients with severe pulmonary vascular disease who are refractory to or progress despite multi drug therapy.[4]

When to refer for lung transplant ?

Patients with PH should be referred early for lung transplant as the clinical course and outcomes are unpredictable.[5] Group I PH with rapidly progressive disease despite maximally optimized therapy, diagnosis of pulmonary veno-occlusive disease or pulmonary capillary hemangiomatosis serve as criteria for referral. [4,6] Delayed referral and logistical issues like poor availability of donor lungs lead to increased mortality on the waiting list. [4] Current recommendations for listing by the International Society for Heart and Lung transplantation (ISHLT) include inadequate clinical response to maximal medical therapy (including parenteral prostanoids) with severe hemodynamic impairment (cardiac index < 2 L/min/m^2 or right atrial pressure >15 mmHg), 6 minute walk distance < 350 m or signs of right heart failure.[6]

Which type of lung transplant ?

Bilateral lung transplant is the surgical standard in Pulmonary arterial hypertension (PAH) as compared to combined heart-lung transplant. [4] This is because outcomes are comparable or better for bilateral lung transplant as compared to combined heart-lung transplant. Moreover the waiting time for lungs alone is generally shorter than for combined organs. Single lung transplant is rarely used as an option due to increased mortality in patients with severe PH and other morbidities like severe primary graft dysfunction (PGD), ventilation/perfusion mismatch and need for prolonged ventilation and mechanical support. [7,8,9]

What happens after transplant ? What is the expected survival ?

After transplantion right ventricular failure reverses, leading to resolution of symptoms. [5] Irrespective of indication, the 3 month survival post lung transplant for PH has increased from 82% in 1998 to 91% in 2013. At the lung transplant program at Gleneagles global health city, Chennai, from April 2017 till March 2020, 14 patients (1 bilateral lung transplant and 13 combined heart-lung transplant) underwent lung transplantion for PAH. The median survival over 3 years for lung transplants performed for PAH is 18 months and the maximum survival recorded till date is 34 months post-transplant at our centre. ISHLT registry data reveal the conditional median survival (expected survival in patients who survive for one year after transplant) to be 10 years for PAH.

What are the pulmonary and systemic complications ?

Immediate complications include pulmonary edema due to ischemia-reperfusion injury, infection, bronchial dehiscence and acute allograft rejection. Major long term complications include bronchiolitis obliterans syndrome (BOS), malignancies and infection. [10] Other complications include systemic hypertension, hyperlipidemias, metabolic dysfunction and diabetes, commonly as effects of immunosuppressant therapy. [11]

Summary

- For patients who do not show good response to PH therapy, lung transplant is an important therapeutic option.
- Apart from the survival benefit significant improvements have been reported in the quality of life after transplant in patients with end stage lung disease. [12]
- Early referral, comprehensive evaluation and listing of the patient is crucial for better outcome. Heart-lung transplant is recommended only for patients with combined lung and heart failure as bilateral lung transplant provides comparable or better outcomes.

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Your personal feedback is always appreciated !

Please do write to The Editor, NCCP(I) Lung Bulletin at ncsarangdhar@rocketmail.com

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