Apollo HOSPITALS

CRITICAL CARE

APOLLO Critical Care

News I Views I Inspiration

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ACECC

Yet Another Centre of Excellence?

Judging from the extensive positive media coverage, the launch of Apollo Centre of Excellence in Critical Care (ACECC), on October 6 this year, can be taken as a huge success. Thank you to all who participated in the launch, which was graced by our Chairman, Leadership, Senior Management, International Dignitaries and Media.

Moving on, the cynic in me keeps challenging – it is all very well to have a good launch, but what about the real work that should follow now?

The genial side of me though, cannot be anything but optimistic about all the opportunities and the work that we together will expand on for the promises made.

The ACECC promises to

1. Oversee development of a Network of Critical Care Hubs and Spokes all over India
2. Define and Recommend Standards of Care through Protocols and SOPs
3. Define and Recommend Quality Indicators
4. Support our partners, both public funded and private, to upscale their facilities and upskill their staff
5. Develop, execute and/or support a comprehensive Educational Programme
   a. Support and add value to ongoing Medvarsity Certificate, Fellowship and individual topic programmes
   b. Develop and run Apollo Knowledge Series programme
   c. Develop with Tele-Health, the curriculum for intermediate and advanced level critical care courses for nurses
   d. Develop and oversee a short-term observership programme
6. Add value to Research and Quality Improvement programmes, and
7. Foster International Collaborations on different fronts

Whilst I admit these promises to be an ambitious aim, it is heartening to see that many of these have already had an excellent start. You may want to visit ACECC's newly launched website (https://www.apollohospitals.com/departments/critical-care/) that has all the details of ongoing programmes.

After successful operation of the Hub and Spoke model in Hyderabad, new Hubs are being created in Chennai and Madurai. Very soon we will start to move to create Hubs in other parts of India.

The keen amongst you would already have noticed the lists of protocols and SOPs as published on the website; this resource is now freely available. In addition, we have made an excellent start to multidisciplinary webinars as part of the Apollo Knowledge Series; the aim is to provide 1-2 webinars every month round the year. Going forward, we will be organising regional CME events, national symposia and international conferences. We will aim to use 'education' as one of the main platforms for integration, transformation and expansion of Apollo Critical Care.

Having kick-started the work to achieve our aims and the promises, I now look forward to your positive engagement and support for this project. It is so important, because the ultimate aim of the centre is totally aligned to Apollo's mission – "to bring healthcare of International standards within the reach of every individual. We are committed to the achievement and maintenance of excellence in education, research and healthcare for the benefit of humanity".

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Update on DVT
PREVENTION IN THE ICU

Let's start with a real life case

An elderly gentleman underwent gastrectomy for carcinoma stomach. The operation was uneventful but, on the first postoperative day the patient suddenly collapsed while undergoing physiotherapy.He was resuscitated and put on invasive ventilation support. Investigation revealed massive pulmonary embolism. He required very high oxygen and vasopressor support. Thrombolysis was contraindicated due to high risk of bleeding. Interventional cardiologist was consulted and he performed a catheter directed thrombus aspiration from the pulmonary trunk. Patient dramatically improved after the procedure, completely recovered and eventually was discharged home.(1)

SCD VTE and DVT

Although this was a happy ending and everything went well after the catastrophe, not every case has a similar good outcome. Massive venous thrombo-embolism (VTE) remains a significant contributor in the causal list of Sudden Cardiac Death (SCD) or Sudden Cardiovascular Collapse in susceptible populations of patients, especially in the ICU setting. Most of the cases happen when a portion of the blood clot due to Deep Vein Thrombosis (DVT) gets dislodged and floats into one or multiple tributaries of the pulmonary arterial system which carries deoxygenated blood from the right side of the heart.(2)

Incidence of VTE in hospitalized or ICU patients

It is estimated that over 50% of hospitalized medical patients are at risk for VTE. Most, if not all, patients admitted in the ICU, are at risk of developing VTE (DVT and or symptomatic PE). Epidemiological surveys have shown VTE rates, in absence of prophylaxis in between 10-80%. Incidence is more for surgical patients as compared to medical but accurate measurement has been difficult.(3,4)

Prevention is better than cure

So, it is easy to say that by preventing formation of DVT, maximum cases of cardiovascular collapse due to Venous Thrombo-Embolism (VTE) can be averted. As the very old adage by Dutch philosopher Desiderius Erasmus says, "Prevention is better than cure", it is widely believed that pulmonary embolism (PE) is the most common preventable cause of hospital death.(5)

Often ignored or neglected

The problem is that, however simple or easy it may sound, the fact remains that this part of general critical care is often ignored or neglected while the medical staff seems too busy with managing "more urgent and pressing" issues about the patient, only to regret later on in hindsight, once the horse has bolted. Numerous surveys have time and again underlined the same unfortunate "neglect" on the part of the ICU clinician.(6) The issue of Thromboprophylaxis or prevention of DVT has been incorporated in the popular general critical care checklist called "FAST HUG BIDS". Yet, it is still missed with somewhat alarming regularity without any proper discernible rationale.

Risks of DVT

The pathophysiology of development of a DVT is related to Virchow's triad which includes stasis or alteration in blood flow, vascular endothelial injury and alterations in the blood constituents leading to a hypercoagulable state.

Some of the conditions which can cause a pro-thrombotic or hypercoagulable state are as follows:

1. Inherited or Acquired pro-thrombotic conditions
2. Immobility for prolonged duration
3. Major surgery
4. Malignancy
5. Sepsis
6. Major trauma
7. Pregnancy
8. Drugs such as OCP, HRT, Tamoxifen, Steroids, Antidepressants
9. Critical illness or ICU admission

In some patients, especially in a ICU setting, many of these risk factors can combine or co-exist to greatly increase the chances of developing DVT.(7) Once DVT has developed, clot dislodgement can happen anytime leading to massive cardiopulmonary collapse when significant. Unfortunately, it has been seen that many of these potentially or actually fatal events happen when the patient has started to get better from his initial illness and was being mobilized. This in turn can lead to major conflict in the healthcare setting as it just comes like a bolt from the blue without any premonition or warning.

How to prevent

Prophylaxis against VTE for hospitalized patients can be of two types :

A) Primary prophylaxis : This is the preferred method of employing counter-measures against the development of venous thrombosis. It could be early, when it is started from admission or delayed, when done after 24 hours.

B) Secondary prophylaxis : This is based on early detection of subclinical venous thrombosis by screening patients with objective tests which are sensitive for the presence of deep vein thrombosis like venous ultrasound, contrast venography, MRI venography, blood markers like D dimer etcetera. The efficacy of these screening tools are not well established and as such this type of prophylaxis is not preferred.(8) Yet, it could be useful in situations where primary prophylaxis is fraught with danger or contraindicated or seems ineffective. It is also used in pregnancy with high clinical suspicion of DVT but negative compression ultrasound test.

Methods

A) Pharmacologic prophylaxis : Unfractionated heparin(UFH), Low molecular weight heparin (LMWH-enoxaparin, dalteparin), Fondaparinux, Direct thombin inhibitor (Dabigatran), Factor Xa inhibitor (Rivaroxaban, Apixaban)(9)

B) Mechanical prophylaxis : Intermittent pneumatic pump (IPC), Thromboembolism deterrent stockings (TEDS)/ Graduated compression stockings (GCS)

Pharmacologic prophylaxis is the preferred mode until it is contraindicated or very high risk of bleeding in which case mechanical means are employed. Some have also used combined methods for high risk patients but till date strong evidence for its advocacy is lacking.

Whenever feasible and as early as possible ambulate patients in the ICU. Active and passive physiotherapy also has an important role to prevent VTE.

Duration of prophylaxis

Prophylaxis against VTE should be continued until the patient is fully ambulatory or discharged from hospital. In some settings it may need to be given for extended period beyond admission.(10)

Awareness

It has been seen in several surveys that till date many of the ICUs still don't employ proper and timely thrombo-prophylaxis in a rigorous manner.(11) In spite of its clear benefit and possibility of harm without, this issue remains a neglected thing amongst intensivists, which is a cause for concern. More and more awareness programs and also use of ICU checklists that includes a point for thrombo-prophylaxis, during daily rounds are perhaps necessary to improve compliance.(12) There should be a mention about why no thrombo-prophylaxis, if that is the case. Many clinicians when confronted with such question as to why it was not given, have agreed to start thrombo-prophylaxis. So, even the senior nurse in-charge of an ICU can be empowered to keep track on which of the patients are not on any form of thormbo-prophylaxis and may ask the respective clinician as to the reason behind it.

Conclusion

It is a well-established fact that by and large all ICU patients are at potentially increased risk of developing DVT and VTE. Yet, patients often go without any thrombo-prophylaxis, either pharmacological or mechanical. This apathy of clinicians towards a serious threat can result in disaster. To circumvent this problem, the need of the hour is to create awareness through training programs as well as implement check-list based system for rounds and also real time ICU audit. As they often say, "A stitch in time, saves nine".

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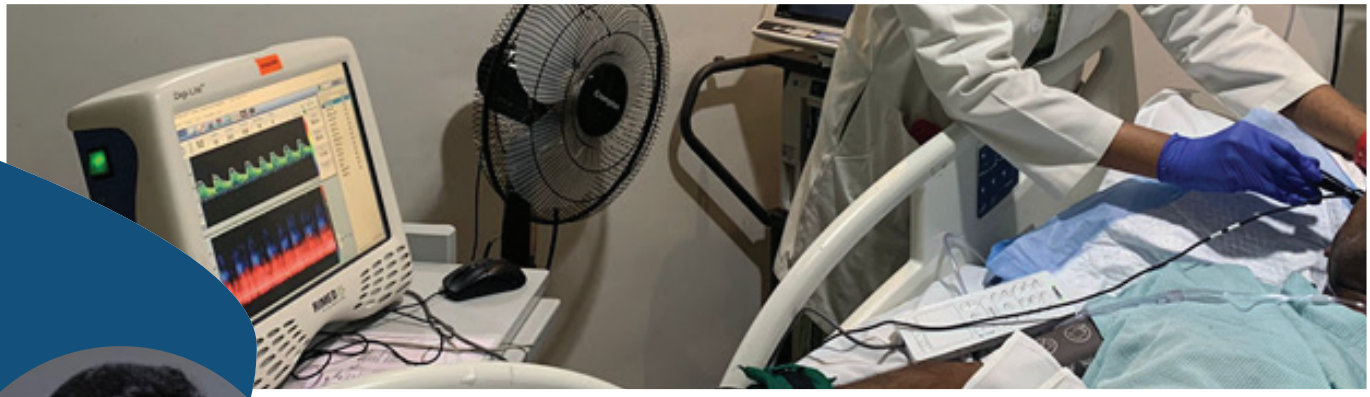
WHAT IS NEUROCRITICAL CARE ?

Neurocritical care is a well-established speciality in the developed world. The increasing number of critically ill neurological patients and emerging modalities of treating such patients makes the need for dedicated neurological intensive care units across medical facilities obvious. Although it is not only about "saving brain," neurocritical care done well salvages injured brain tissue, prevents secondary damage and improves the possibility of neurologic recovery [Lazaridis C, Altaweel L, Karakitsos D. Updates in Neurocritical Care. Crit Care Res Pract. 2018;2018:1617359. Published 2018 Aug 1. doi:10.1155/2018/1617359]. Managing neurocritical care patients in a general ICU is difficult as they warrant a different approach. The success of the speciality is due to integration of various sub-specialities, namely neurology, neurosurgery, neuro-anaesthesiology, interventional neuroradiology and neuro-critical care.

In Apollo Hospitals , Jubilee HIlls ,Hyderabad we have two neuro intensive care units which includes 20 ICU beds dedicated only for neurocritical care patients. Our neurocritical care team comprises excellent neurointensivists, neurosurgeons, neurophysicians, , well trained nursing staff, support care staff and physiotherapists working in coordination.

We have the DNB course in the speciality of neuroanaesthesiology and neurocritical care, where trainees have an excellent exposure to a variety of cases, research and advanced modalities of medical care . The Department is equipped with the latest and best of the equipment (anaesthesia work stations, advanced critical care ventilators, multiparameter monitors, echocardiography, latest airway gadgets, drug delivery systems, temperature management systems, brain function monitors etc) required for meeting the complex challenges in the neurosurgical operating rooms and intensive care units. Various monitoring modalities are being used in our neurocritical care units including ICP monitoring (intraventricular/optic nerve sheath diameter), Transcranial Doppler, We follow evidence based medicine and have protocolised the workings of the department. In stroke patients where time is an important factor in determining the outcome, we have established a separate stroke pathway, that incorporates diagnostics and interventions to try and improve outcomes. Similarly we have a trauma pathway that involves multidisciplinary teams to assess , resuscitate and treat polytrauma and neurotrauma victims.

Over several years, the department has grown both in stature and eminence and is recognised as one of the best centers in treating neurocritical care patients all over India.



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INTRA PERICARDIAL TERATOMA
A RARE NEWBORN TUMOR

Introduction

Intra Pericardial Teratoma is a rare tumor detected in fetal life with a very high mortality. The incidence is said to be 0.05%-0.15% [1]. The tumor arises from all three germinal layers. Teratoma are commonly seen in the anterior mediastinum [2]. The tumor can be associated with non-immunologic hydrops fetalis revealed by fetal anasarca[2].They are commonly benign, but cause serious complications such as cardiac tamponade in the fetus and newborns[1].

Case

A routine ultrasound of a mother at 20 weeks of gestation detected a tumor arising from the surface of the heart which had the potential of impacting growth of the fetus within the womb. From that day the fetus' condition was monitored regularly every week by the means of fetal echocardiogram (to evaluate the growth of tumor and any impact on the heart function). Pericardiocentesis was done to reduce pressure on the fetal heart and enable the mother to continue pregnancy to term.

The baby boy was delivered on 21st July 2021 by LSCS at Indraprastha Apollo Hospital ,Delhi and he weighed 3.2kg. As he had respiratory distress, he was intubated and put on a ventilator. A CT Angiogram was done which showed a 7 cm across, lobulated giant intrapericardial tumor. It was pushing the heart to the left which in turn was compressing the left lung. Excision of the tumor was done on 23rdJuly.The baby had to be put on cardiopulmonary bypass as the origins of the gigantic mass were unclear and handling of the tumour was affecting the baby's blood pressure. Finally, it was found to be adherent to the ascending aorta and right atrioventricular groove,from which it was shaved off in one piece. The baby was electively ventilated over next 48hours due to mild RV dysfunction. Once the clinical status improved the patient was weaned and extubated on nasal CPAP on the 3rd post-operative day. The CPAP was removed and the baby was transitioned to nasal prongs over next 72hrs. The expressed breast milk fed through nasogastric tube was gradually transitioned to oral feeds. On 8th post-operative day, the baby was shifted to ward and breast feeding was initiated and oxygen was tapered off gradually.

Nursing care: Temperature regulation, monitoring blood pressure, strict I/O, managing hyperkalemia with insulin were the crucial responsibilities.Blood glucose was maintained between 75 - 125 mg/dl through IV maintenance fluid titration. Post extubation upper airway clearance and positioning was the key to sustain extubation while nasal CPAP was optimized.Nurse to patient ratio was ensured 1:1 for continuity of care in the ward till discharge.Psychological support was given to the mother with all her due anxieties in baby care.

Discussion

The baby is normal and healthy and has been discharged on 4th August 2021. The predischarge echocardiogram shows good biventricular function, right to left shunt across patent foramen ovale, mild hypoplasia of tricuspid valve and normal ventricular function. Although the excision of tumor is thought to be curative in most cases, due to the rarity of the diagnosis, the baby requires regular follow-up with tumor marker levels and echocardiographic examinations in the future.

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AUGMENTED RENAL CLEARANCE IN THE INTENSIVE CARE UNIT

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I. Definition:

Augmented renal clearance (ARC) is a pathologic phenomenon in which the kidneys exhibit an increased glomerular filtration capacity beyond what is seen under normal conditions. Based on a study which noted sub-therapeutic concentrations of ß-lactam antibiotics when given in standard doses, ARC is said to be present when the measured creatinine clearance is ⩾ 130 ml/min/1.73m2 [1].

II. Pathophysiology

It is usually seen in critically ill patients who have an increased cardiac output and improved organ perfusion as part of an intrinsic compensatory response, when the acute illness is in its early stages. Systemic inflammatory response syndrome associated with sepsis, ventilator associated pneumonia, trauma, burns, pancreatitis and surgery have all been implicated as reasons for the increase in cardiac output and amplified blood flow to kidneys, eventually leading to increased renal clearance of hydrophilic medications [2,3]. Use of crystalloids for fluid resuscitation could also contribute to this phenomenon by increasing the preload and thereby, the cardiac output [4].

III. Risk factors and prediction scores

The most important risk factors linked with the development of ARC are young age, male sex, trauma and less severity of illness. It is also associated with better initial renal function and absence of diabetes [5,6]. Udy et al. [7] put forth the ARC scoring system based on a prospective observational study to identify risk factors for development of ARC and lesser age (age < 50 years), trauma and lower modified SOFA score formed the components of ARC score, earning scores of six, three and one respectively. Patients with a score ⩾ 7 were found to have the greatest risk for development of ARC. Akers et al. [8] found that the ARC score had a sensitivity and specificity of 100% and 71.4%, pertaining to detecting increased clearance. In 2017, a newer scoring system called the ARCTIC score was developed by Barletta et al. [9], based on a retrospective study conducted in a trauma intensive care unit. The four components of ARCTIC score were age ⩽ 56 years, age between 56 – 75 years, serum creatinine less than 0.7mg/dl and male sex and each carried a score of four, three, three and two respectively. A total score of ⩾ 6 was found to predict a high risk for development of ARC and had a sensitivity and specificity of 84.3% and 68.2% respectively. ARCTIC score was developed in patients admitted specifically to the trauma ICU and has not yet been validated in critically ill patients with other diagnoses.

IV. Measurement

Augmented renal clearance can be ascertained by estimating the creatinine clearance (CLcr) in a patient. Although many formulae to estimate CLcr (Cockcroft – Gault, MDRD and CKD – EPI) do exist, they are unreliable in estimating CLcr in the critically ill population. Many studies have found a lack of correlation between the CLcr calculated using these formulae and the measured CLcr using continuous urinary collection methods [10, 11, 12]. Hence, continuous urinary collection techniques have been advocated for measuring estimating CLcr accurately [10, 11, 12]. Though a consensus regarding the most accurate duration for continuous urine collection for measuring CLcr does not exist, Cherry et al. [13] determined in their study that 8 hours was the minimum period of continuous urine collection that would provide a good balance between accuracy and feasibility.

V. Clinical implications

Augmented renal clearance has been associated with sub-therapeutic levels of medications, sub-optimal treatment and failure to attain pharmacodynamic targets, resulting in treatment failure and increased risk of anti-microbial resistance [1,8,14,15,16]. Antibiotic activity is either a function of time or concentration [17]. Antibiotics that display time dependent activity (eg : ß lactams) do so as a function of time spent at a concentration above the MIC of the causative organism [%fT > MIC]. Concentration dependent (eg: vancomycin) antibiotic goals are expressed in terms of a ratio between maximum achieved concentration and the MIC (Cmax/MIC) or the area under the concentration curve and the MIC (AUC/MIC). Achieving these targets in patients exhibiting ARC has proven to be quite difficult and the conclusions derived from multiple studies are a testament to this. In a prospective observational study conducted by Claus et al. [18], 51.6% out of 128 patients had ARC and therapeutic failure was observed more in the ARC group, which was statistically significant. Furthermore, sub-therapeutic dosing might lead to increased development of antibiotic resistance [16].

Campassi et al. [2] noted that none of the patients exhibiting ARC had their vancomycin levels within the trough level target of 15-25 µg/ml three days following initiation of vancomycin despite getting higher doses. Spadaro et al. [19], in their study, noted that the in-hospital mortality was significantly higher in those who did not attain a therapeutic trough target of vancomycin of 15-25µg/mL.

Similar findings of sub-therapeutic drug levels and failure to attain pharmacodynamic targets could be seen in studies comparing therapeutic levels of ß lactam antibiotics and ARC. A study conducted by Udy AA et al. [1

comparing therapeutic levels of β lactam antibiotics and creatinine clearance in the critically ill showed that a CLcr of > 130 ml/min/1.73m2 was associated with a trough level less than MIC in 82% and less than 4 times MIC in 72 %. In a study done by Carlier et al.[15], critically ill patients receiving meropenem or piperacillin/tazobactam were included and 48% of them did not meet the desired PK/PD criteria (100% fT>MIC), of which 80% had a CLcr of > 130ml/min/1.73m2. They also noted that 7 out of 19 (37%) patients who exhibited ARC did not attain a minimum PK/PD target of 50%fT>MIC.

Multiple observational studies have studied the prevalence of ARC among patients in the ICU. Udy AA et al. [20] reported an ARC prevalence of 65.1% among 281 patients, in their multicentric, prospective observational study. Wu et al.[21] conducted a prospective observational study in Taiwan and found the prevalence of ARC to be 46% among 100 patients and a significant failure to attain PK/PD target for β lactam antibiotics in those having ARC.

VI. Conclusion

A significant proportion of critically ill patients exhibit "Augmented renal clearance" (GFR >130ml/min/1.73m2). This phenomenon might not be overtly visible and is associated with sub-optimal plasma levels of commonly administered antibiotics and treatment failure. A higher than recommended dose of antibiotics and other renally excreted medications might be required in the initial few days of ICU admission, if the risk factors for development of ARC are present. Further studies are required to validate ARC and ARCTIC scores as reliable tools to predict the occurrence of ARC among patients admitted to the ICU.

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"QUIET TIME":

Improves the Patient Outcome

"Unnecessary noise, then is the most cruel absence of care which can be inflicted either on the sick or well"- Florence Nightingale

Noise is present in almost every aspect of our lives. It is an environmental stressor that is known to have physiological and psychological effects. A quiet environment promotes rest and healing but is often challenging to provide in a busy acute care setting as concluded by Hedges et al in 2019. Moore and colleagues added that noise is the most important factor in provoking pain during the bedridden and post-surgical periods.

WHO guideline for suggested noise level is **35 dBA during daytime and 30 dBA during night time.**

Sources of Noise are staff activities, patient and patient family activities, staff speech, alarms, device operation noise and equipment related noise. Effects of Noise in many studies have shown that noise pollution in the hospital causes physical,psychological and social problems. Noise affects both the well being of the patient and the productivity and well being of health care staff.

The **"CULTURE OF QUIET"** has to be an organizational initiative.

Quite by Design: " Designs decide quietness"- Hospital infrastructure to showcase quiet environment. The signage is visible in patient care areas to help keep patients , family and visitors aware .The hospital units have designed "quiet hours" with automatic dimming of lights.

Quiet by Decision: "Decisions decide quietness"- Making judgments by tracking quietness -providing complimentary ear buds , headphones and ear plugs for patients and their families , Coordinating care to reduce unnecessary entry into patient rooms during the quiet hours ,and reminding staff to be quiet in patient care settings and keeping hallway conversation to the minimum.

Quiet by Management: "Management decides and designs quietness"- Setting strategy of an organization and coordinating the efforts with employees to achieve quietness .Coordinating care to reduce unnecessary entry into patient rooms during quiet hours, scheduling floor cleaning times that do not conflict with the night time resting hours, placing work orders through a dedicated system to have noisy carts , doors and other items repaired and providing "white noise" TV channel in all patient rooms.

Quiet by Practice: "Practice promotes quietness"-Actual application of an idea and decisions made by management by employees to promote quietness- Staff to be quiet in all patient care settings and wearing soft sole shoes to minimize hallway noise , minimizing cell phone conversation in the hospital hallway and waiting rooms and encouraging others to do the same and encouraging patients and staff to respect others by turning down the volume of cell phones, televisions, radios, pagers and other devices. Reducing noise level at the critical care unit includes strict control on visitor policy, setting clinical alarms (higher and lower limit) on ventilators, monitors and infusion pumps. Preventive and maintenance sticker of all medical equipment periodically and providing warm milk for patients at bedtime if suitable.

Innovations made were light music to be played in CCU set up, noise decibel meter to monitor noise level and Sssssh. Campaign and of awareness among the healthcare workers and involved family members.

Patients who are dissatisfied with noise in their rooms are often significantly less satisfied with their overall hospital experience.

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AI IN THE ICU

a brief introduction

As critical care access and technology evolves the automated analysis of data is expanding rapidly . New insights are being generated using machine learning. This article is a brief overview of this emerging space and is listed as a set of frequently asked questions . One recent good overview had a lot of good examples of AI in critical care. [Gutierrez G. Artificial Intelligence in the Intensive Care Unit. Crit Care. 2020 Mar 24;24(1):101. doi: 10.1186/s13054-020-2785-y. PMID: 32204716; PMCID: PMC7092485.]

What is AI?

As seen in the graph AI is rapidly gaining traction in the research area . The number of studies in PubMed is quite large using the search terms AI and Critical Care Medicine.According to the Encyclopedia Britannica, artificial intelligence (AI) refers to a system "endowed with the intellectual processes characteristic of humans, such as the ability to reason, discover meaning, generalize, or learn from past experience." Some common examples include ride sharing apps, food delivery apps and many travel search engines .

What is ML?

Machine Learning or ML is a subset of AI and uses special statistics to analyze data. Pattern recognition, data grouping and anomaly detection are some examples.

What is explainable AI?

AI systems learn like children. They can also evolve and come up with their own inferences. Some of these may not be readily understood due to a lack of direct biological explanation. Explainable AI seeks to clarify the methodology used to generate an inference and is used to build confidence in an AI system.

What is the anticipated role of AI in critical care ?

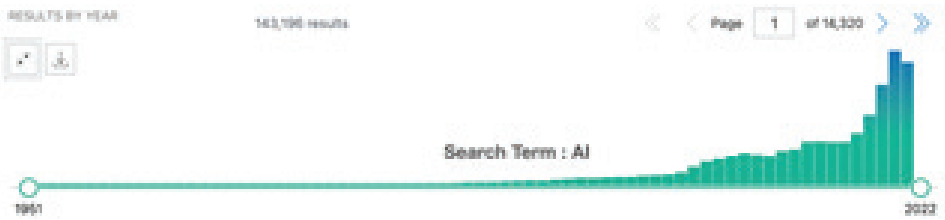
AI can assist in diagnosis and management . Augmented intelligence may be more realistic in the near term and include clinical decision support. Data analytics of continuous patient monitoring parameters has also allowed early warning scores for deterioration as well as sepsis alerts . Predictive analytics is being widely used in various fields and critical care has a lot of scope to use these rapidly advancing techniques.

Are there examples of using AI in critical care ?

Radiology image interpretation has been extensively evaluated using AI and includes identifying tubes and lines as well as intracranial bleeding for example. Systems are available that can outline an endotracheal tube and show how high it is above the carina for example. At Apollo Hospitals in the COVID crisis data was analyzed to come up with a mortality prediction model [Kar S, Chawla R, Haranath SP, Ramasubban S, Ramakrishnan N, Vaishya R, Sibal A, Reddy S. Multivariable mortality risk prediction using machine learning for COVID-19 patients at admission (AICOVID). Sci Rep. 2021 Jun 17;11(1):12801. doi: 10.1038/s41598-021-92146-7. PMID: 34140592; PMCID: PMC8211710]. There are also systems that can detect hypotension early using arterial wave form analysis[Hatib F, Jian Z, Buddi S, Lee C, Settels J, Sibert K, et al. Machine-learning algorithm to predict hypotension based on high-fidelity arterial pressure waveform analysis. Anesthesiology. 2018;129(4):663–74.]

Another example uses ventilator waveform analysis to detect the cause of patient ventilator dyssynchrony.[Blanch, L., Sales, B., Montanya, J. et al. Validation of the Better Care® system to detect ineffective efforts during expiration in mechanically ventilated patients: a pilot study. Intensive Care Med 38, 772–780 (2012). https://doi.org/10.1007/s00134-012-2493-4]

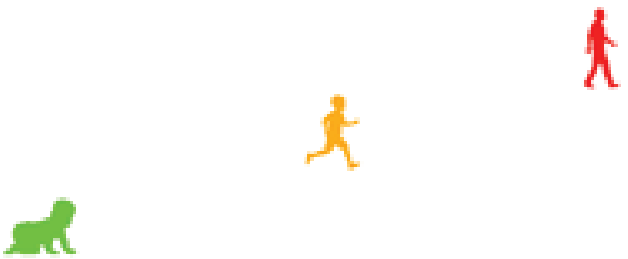
An AI based system is another member of the healthcare team and will be part of a multidisciplinary approach to critical care. In resource poor settings as well as advanced locations AI can make critical care easier and safer. The large amount of data generated by various devices can be interpreted quickly and meaningfully using automated systems. The role of the intensive care provider in delivering compassionate care at the bedside will only be enhanced with technology when used judiciously.



How do AI systems learn ?

Like children

- Pattern recognition
- Not the same as simple computer programs that use IF/THEN/ELSE commands
- Can evolve



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LEARNING DURING CRISIS:

The Impact of COVID-19 on Hospital-Acquired Pressure Injury Incidence

Introduction:

The introduction of a pandemic to an environment that is potentially at-risk for adverse events may result in unintended patient safety and quality concerns. Hospital acquired pressure injuries (HAPI) are a major problem in any health care organization for several decades.

As per an evidence based study, using a retrospective, observational design and descriptive statistics to evaluate trends in HAPI from March to July 2020, hospital-acquired pressure injury numbers have fluctuated from a steady increase from March–May 2020. However, the trend in the total all stage HAPIs began to decline in June 2020 during the COVID-19 pandemic. The experience has demonstrated the ability of our organizational leaders to learn quickly during crisis.

For COVID-19, proning or positioning a patient on the stomach with the chest down and back up, may be a factor in the development of pressure injuries, particularly on the face and neck for this population of patients in ICU care areas.

The benefits of prone positioning for respiratory patients include better aeration of the lungs, an important consideration for the respiratory distress experienced with COVID-19.Pressure injury prevention is a great challenge though for better oxygenation prone position is always recommended. An expert team is required to prevent pressure injuries caused due to proning process.

Process to prevent Hospital Acquired Pressure Injuries:

- Vigilant head-to-toe skin assessments are of utmost importance
- Proning to be done after skin assessment.
- Pressure areas to be monitored & Air mattress to be provided.
- Continuous monitoring & reassessment to be done
- Patient has to be kept in prone position maximum 16 to 18 hours followed by supine position
- Monitor skin condition and care should continue as per protocol
- During securing of any tubes & drains should be more careful
- Prophylactic dressings should be applied to protect surrounding skin with positioning devices
- To ensure that there is no unsecured tape to fix the devices under the chest

Further Reading and References :

1. European Pressure Ulcer Advisory Panel (EPUAP), National Pressure Injury Advisory Panel (NPIAP), Pan Pacific Pressure Injury Alliance (PPPIA). Prevention and treatment of pressure ulcers/injuries: clinical practice guidelines. The international guideline. 3rd ed. Emily Haesler, editor. EPUAP, NPIAP, PPPIA; 2019.

2. Pressure injury prevention for COVID-19 patients in a prone position; Barakat-Johnson, M.; Carey, R.; Coleman, K.; Counter, K.; Hocking, K.; Leong, T.; Levido, A.; Coyer, F.. Wound Practice and Research; 28(2):50-57, 2020. Article in English | Web of Science | ID: covidwho-1060195

3. American Association of Critical Care Nurses. https://www.aacn.org/education/webinar-series/wb0042/why-prone-why-now-improving-outcomesfor-ards-patients

4. Polancich,S et al; Learning During Crisis: The Impact of COVID-19 on Hospital-Acquired Pressure Injury Incidence, Journal for Healthcare Quality: May/June 2021 - Volume 43 - Issue 3 - p 137-144

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PUZZLE—

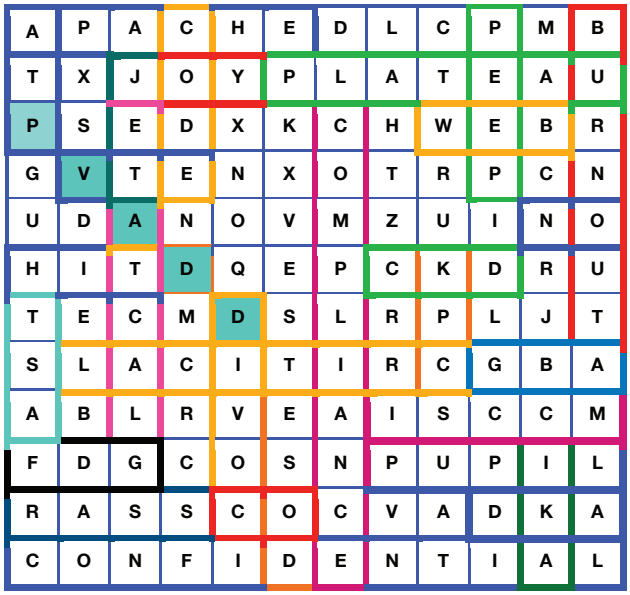
KNOWLEDGE ZONE

A	P	A	C	H	E	D	L	C	P	M	B
T	X	J	O	Y	P	L	A	T	E	A	U
P	S	E	D	X	K	C	H	W	E	B	R
G	V	T	E	N	X	O	T	R	P	C	N
U	D	A	N	O	V	M	Z	U	I	N	O
H	I	T	D	Q	E	P	C	K	D	R	U
T	E	C	M	D	S	L	R	P	L	J	T
S	L	A	C	I	T	I	R	C	G	B	A
A	B	L	R	V	E	A	I	S	C	C	M
F	D	G	C	O	S	N	P	U	P	I	L
R	A	S	S	C	O	C	V	A	D	K	A
C	O	N	F	I	D	E	N	T	I	A	L

There are at least 27 words hidden in the grid above . Some words are horizontal, some vertical , some backwards and at least one diagonal. All have some relationship to healthcare . Can you find them ? Take a picture of your solved puzzle and email to **jude_t@apollohospitals.com** before Jan 02, 2022 and the first five complete correct entries will be recognized.

This puzzle designed by Dr Sai Praveen Haranath .

APACHE	CRITICAL	AST
JOY	ISCCM	BURNOUT
PLATEAU	PUPIL	COVID
WEB	DKA	COMPLIANCE
DDAVP	CO	ATP
VTE	RASS	JET
NO	LACTATE	CODE
CKD	ABG	DOSE
HIT	FDG	CONFIDENTIAL



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Please send your suggestions and article contributions to your critical care coordinator

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