Digitization of Intensive Care Unit

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Introduction

- Digitization
- ICU

- Digitization is defined as the socio- economic conversion that responded from the vast acceptance of digital technologies to exhibit, process, and circulate facts. it provides economic development and creates abundant job openings.
- In the report of the World Economic Forum, it's stated that if there's a rise of 10% the digitization score of any nation, either it would respond in 0.75% growth in its GDP per capita.(iPleaders)

- The Intensive Care unit (ICU) is a complex environment, sophisticated area which is specifically designed, staffed, located, furnished and equipped dedicated to management of critically ill patients.
- Caring for complex patients requires communication and coordination of multiple healthcare team members and changes in work routines could affect their ability to provide safe, high-quality care.
- Every year about 5 million patients are admitted to the ICU wards in India.(Trivitron)

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- Dabliz et al., (2019) this paper explores the impact of an electronic medication management system (EMMS) on users in an intensive care unit Results showed that performance expectancy, effort expectancy and facilitating condition all increases with overall user satisfaction of patients. Overall, teams external to the ICU are in strong favor of its implementation.
- Desautels et al., (2016) We apply Insight, a machine learning classification system that uses multivariable combinations of easily obtained patient data (vitals, peripheral capillary oxygen saturation, Glasgow Coma Score, and age), to predict sepsis using the retrospective Multipara meter Intelligent Monitoring in Intensive Care (MIMIC)-III dataset, restricted to intensive care unit (ICU) patients aged 15 years or more and Despite using little more than vitals, Insight is an effective tool for predicting sepsis onset and performs well even with randomly missing data.
- Digitized health information systems in the ICU have played an important role in enabling clinician access to patients, which is particularly evident in tele-health systems. Tele-health applied to critical care settings can reduce physician isolation, and improve the collaboration of providers. Avera health for example, connected 36 hospitals across nine US states, reducing length of stay, mortality, cost of care, and clinician burnout (www.philips.com).

Research Objectives

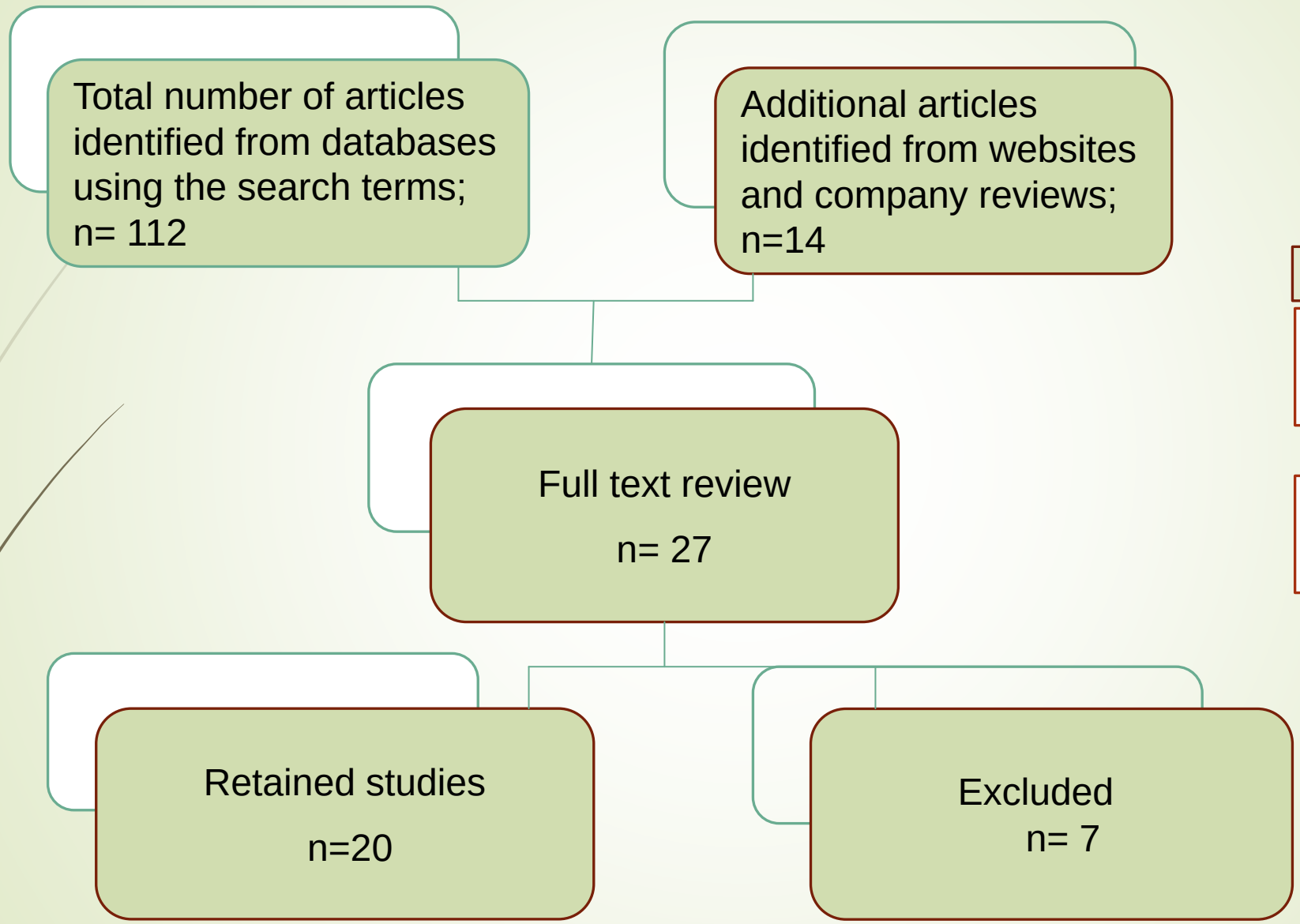
- The objective of this study is to analyze the change in Intensive care unit due to digitization.

METHODOLOGY

Method- Secondary Research, literature review.

Electronic database- PubMed, Springer, Taylor, Research gate Google scholars and others like articles, press release.

Search strategy- keywords used Digitization, new, intensive care unit, digitization and patient experience, patient and staff experience.



Exclusion criteria

Full text of article not available

Articles and studies published any time between 2013 and 2021.

Evolution of critical care through digitization between sixties to twenties

Technology	Utilization	Year
Electronic Medical record	Clinical decision support for blood disorders evaluation (Lipkin)	1961
Improved Monitoring for Brain Dysfunction in Intensive Care and Surgery (IBIS)	mathematical repository that incorporates almost all of the information and other diagnostic information gathered from critically ill patients throughout surgeries and critical care. The goal of the DL is to lay the groundwork for the project Improved Monitoring for Brain Dysfunction in Intensive Care Unit and Surgery to create bio signal interpretation tools	2000
GE's Centricity Critical Care system(clinical information system in ICU management solution)	It enhances quality care in ICU by lower the likelihood of errors, save time, & significantly reduce costs & provide strategic framework to healthcare workers	2003

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Phillip Clinical Decision Support	It includes patient monitoring system in ICU to visualize clinical relevant information make informed decisions and intervene early by providing horizon trends, ST map in acute coronary syndrome patients	2014
Vital sky system by Phillip's	light-based medical device to reduce delirium in intensive-care patients.	2018

Utilization of digital services in Intensive Care Unit

- **(a)Electronic Health Record for ICU**
- Electronic health records are used in Intensive Care Units because of the quantity of data that must be handled for patient care, biological and microbiological results, pulmonary and hemodynamic status treatment and therapeutic strategies.
- **(b) Critical care services via telemedicine**
- The information system transmits all relevant patient data from the hospital to a centralized tele-ICU center through digitalization which allows intensive care physicians and other specialists to continuously monitor the patients in different, geographically distributed ICUs, supporting local medical staff. While the patients remain in familiar surroundings, they benefit from the care provided by an interdisciplinary team of experts.
- Digital technologies such as telemedicine also make it possible to transfer patients out of the ICU into general wards much sooner. Another benefit is that critical care patients could also be monitored remotely.

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- **(c) Enhancing healthcare professionals efficiency to Critical cases**
- Philips IntelliSpace Critical Care & Anesthesia (ICCA) is often a clinical information technology with patient safety system that aims to improve patient care there in ICU.
- **(d)**The development of algorithms for clinical decision support in critical care has only been possible through digitization and improvements in clinical data management. Rich critical care databases have been essential in the development of new algorithms as well as discovering correlation between treatments, medications, co-morbidities, and outcomes, improved triaging/allocation leading to less readmissions

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- **(e) Patient care-**
- 24-hour light therapy Vital Sky an artificial sky reduces delirium incidences by over 50 percent and the circadian rhythm is maintained even in ventilated intensive care patients.
- Ascom Minco 2 smartphone

- **(f) Healthcare workforce**
- eHealth / mHealth (EM) utilization augments the efficiency of clinical practitioners less paper work and more rapid access to information means effects positively on the performance and practice of healthcare workers. increased productivity converts into accelerated availability and capacity to provide services to number of users, even if the absolute numbers of health workers remain constant.
- EM give providers rapid access to valid information, second opinions and guidelines, all of which contribute to scaling-up the quality, competencies and compliance with professional standards, and thereby improving patient safety.

- **(g) Revenue & Nurses efficiency**
- In critical care units nurse fills form manually to collect organ support data which sometimes led to the missing information of organ intervention that occurs for the short time period during 24 hours causes missing or incomplete information and increases the financial burden.
- GE Healthcare’s Centricity (Critical Care Information System) collect data digitally reduces the chances of error and reduced the working load of nursing staff.

Discussion

Automatic digital recording of patient data from medical devices has successfully improved time efficiencies and finances to put patient care firmly back at the heart of ICU management also, reduction in human errors and elimination of handwriting illegibility issues

An increasing average of 3500 patients per year across 3 different ICU areas. Facing ever growing demands, a digital transformation project was rolled out to improve productivity of patient beds, rather than needing to build more bed capacity.

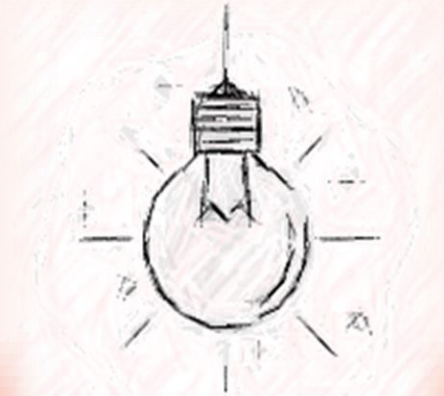
Financial income had increased and nursing staff had more time to focus on the patient. 2 hours of nurse time saved every 24 hours which is equivalent of 17.5 whole time nurses each year.

The digitalization of critical care has helped in finding information more efficiently, helping to reduce errors in misdiagnosis, reduced documentation time up to 30.

Conclusion

- The digitalization of health not only involves to implement digital solutions but it also involves, and above all, to support general practitioners, medical specialists, and caregivers in the future medical sphere and for the improvement of treatment conditions.

- They also make it possible to consult experts, facilitate remote patient monitoring and treatment, and support intelligent alarm management. All of this can help reduce anxiety and stress on the part of medical staff and patients.



They can help improve patient safety and the quality of care. Ultimately, this reduces cost and saves money.

- It is important to remember that digital solutions must be available to many people as possible for both Western and emerging countries where access to medicine turns out to be an unbounded complexity.

- Digital technologies can make a big and vital contribution to the future of intensive care unit design. They can reduce the burden on physicians and nursing staff and eliminate repetitive and cumbersome tasks.

The intensive care unit (ICU) is related to a number of the highest mortality, morbidity, and error rates, creating it a vicinity or region wherever digitization is especially fundamental to assist and enhance the standard of care because the diligence works towards achieving the fourfold objectives to assist & address these issues-the point of superior case advancement and improved understanding which enhances patient and practitioner experiences to try and do this, the diligence should embrace the shift to digitisation.


Thank
you