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Ameliorate Patient Care and Safety with Technology

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The word “Patient” has been derived from the Latin word "Patior" which means "to suffer". It represents the sense of feeling pain as well as sense of forbearance.[1]Whereas patient care is defined as the prevention, treatment and management of diseases and the preservation of physical and mental well-being.[2] This is attained by the services of health professionals. Patient safety is a discipline that emphasizes in through the prevention, reduction, reporting, and analysis of and other types of unnecessary harm that often lead to and even deaths by these medical errors.[3]

Healthcare information technology is the processing of information that deals with storing, retrieving, sharing, and using health care information data as patient records. These records are used for diagnostic, treatment and prognostic purposes, knowledge for communication and decision making etc. This was attained initially by utilizing computer hardware and software but later on mobile applications, wearable and non-wearable medical devices and virtual reality sessions were also included under its umbrella.[4]

The main technological strategies implemented in developed countries concerning patient care and safety are as follows:

(A) Electronic prescribing and patient electronic portal: is entering medication orders using a computer or mobile application. This is of great help in improving the safety of medication orders and hence patient safety. It facilitates the prevention of errors by ensuring the availability of information regarding preferred drug doses, route and frequency of administration, patient allergies, drug-drug or drug-lab interactions, and also helps prescribing based on standard clinical guidelines, ordering of tests, procedures and even consultations etc. Patient electronic portals are also in use to provide access to patients to personal health information and an opportunity for electronic communication with respective care provider through the computer or mobile device.[5]

(B) Clinical decision support: is the provision of helping tools to the clinicians in the form of notifications, alerts, reminders, clinical guidelines, condition-specific order sets, patient-specific clinical summaries, documentation templates, investigation and diagnostic support etc.[6]

(C) Bar coding on medications: is the method to integrate electronic medication administration records with bar code technology to ensure the provision of right medicines to the right patient and at the right time. Soft wares are used which create alerts when an error is liable to occur due to confusion between drugs having look alike and sound alike similarities.

Thus barcoding of medications improve their administration at the patient`s bedside and helps to meet the five standard steps of medication administration guidelines: the correct drug, dose, time, route, and patient. The barcoding is linked in developed countries with the wristband or armband code so that the nursing staff matches the bar code of the patient`s band with the medications making it an effective way to reduce if not completely control the incidence of adverse drug events.

(D) Telemedicine and tele-monitoring: is facilitating patient`s communication to prescriber/ provider and vice versa by using telecommunication technologies. It could be synchronized with real-time 2-way video communication or just an asynchronous transfer of patients` clinical information. Conversely this could also act as a tool to track patients and change their behaviour. The strategy is being utilized to monitor patients at remote sites specially for monitoring chronic conditions like, cardiac failure,[7] cerebral stroke, bronchial asthma, hypertension etc. A Patient data management system (PDMS)[8] is also available to automatically retrieve data such as from bedside patient monitor, ventilator, intravenous pump etc.[9]

(E) Electronic incident reporting: is an automated web-based system to report safety events voluntarily. Such reporting may improve clinical processes and reduce medical errors. The incident report consists of only relevant factual details, date, time, location of the incident, witnesses and their statements regarding the incident. This also includes actions taken by all concerned during the immediate time frame, any observations related to the incident, record of associated injuries, presence of contributing environmental factors,

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corrective action(s) accomplished and preventative measures identified and undertaken. Developing automated system for incident reporting management has eliminated the risk of duplication and differing reports since the paper is no longer used for reporting. It is an effective means of sharing the real time information with consistency and accuracy through drop-down menus generations. Moreover, tracking is also possible if required later on.[10]

(F) Virtual reality sessions: are being used to help ease situations in a controlled environment such as for relieving pre-operative surgery anxiety, post-traumatic stress disorder (PTSD), phobias and in pain management. In addition, it is practical component of geriatric rehabilitation for patients with Alzheimer's disease, Parkinson`s disease etc.

(G) Wearable medical devices: These are devices which the patient can easily worn such as exercise trackers, calorie trackers, biosensors for heart rate, respiratory rate and temperature measurements, sweat meters, oximeters, smart watches, blood pressure monitors, devices to determine the degree of the sickness of the user, long-term ECG having cardiac and circulatory problems, devices for measurement of weakness and risks of various age-dependent diseases, devices to predict changes in mood, stress, and health, measurement of alcohol content in the blood, assessment of athletic performance, etc.[11]

(H) Non-wearable medical devices: (a) 3-D printing: this additive manufacturing process that creates a physical object from a digital design. The process works by laying down thin layers of material liquid or powdered, plastic, metal or cement and then fusing the layers. This technology is facilitating many areas of surgery like total joint replacement, cranio-maxillofacial reconstruction etc. It is also helpful in development of specific patient-matched devices like prostheses. Printed casts are in use for broken bones that can open up allowing the wearer to scratch, wash and ventilate the damaged area. Production of 3D printed tablets is another use of this technique employed in the pharmaceutical industry (b) bio-printing: is used for tissue engineering applications to develop organs and body parts by use of inkjet techniques (c) Robotic surgery: also called robot-assisted surgery, allows surgeons freedom to perform the procedure with more accuracy and precision than the conventional means. It has the advantage of minimal invasiveness as procedures are performed after giving small incisions[12]

Technology outburst that has taken place in this century beyond doubt is improving patient care and safety around the globe. It is worth mentioning here that awareness must be created followed by initial investment, sufficient training of users, gradual implementation and sincere gauging of pacing to build up and sustain a robust system based on technology. In Pakistan use of limited technology during covid-19 pandemic has shown a positive and significant impact on patient safety and quality of care. It has reduced the travelling cost, travelling time, helped for getting faster lab results, immediate accessibility of medical information to doctor and patient for timely diagnosis and start of therapy. The knowledge and awareness of people must be enhanced regarding the importance to adopt information technology.[13] Some challenges prevailing in Pakistan are also recognized which include limited availability of internet facilities, cell phone ownership, network coverage, non-availability of regulatory frameworks, regulations for data protection and security,[14]accessibility, affordability and last but not the least the habit of using paper-based health records.[15]

Despite of all these challenges healthcare information technology must be adopted with an affordable and feasible framework suitable for our country to ameliorate the patient care and safety.

Healthcare and information technology professionals, pharmaceuticals and NGOs should play their role in developing this framework. Whereas due addressing by Governmental sectors in this context is the need of today in the vested health care interest of the people linked with economy of Pakistan.

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Nasim Karim: Substantial contributions to the conception criticaly evaluation of intellectual content, final approval of the version to be published.

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