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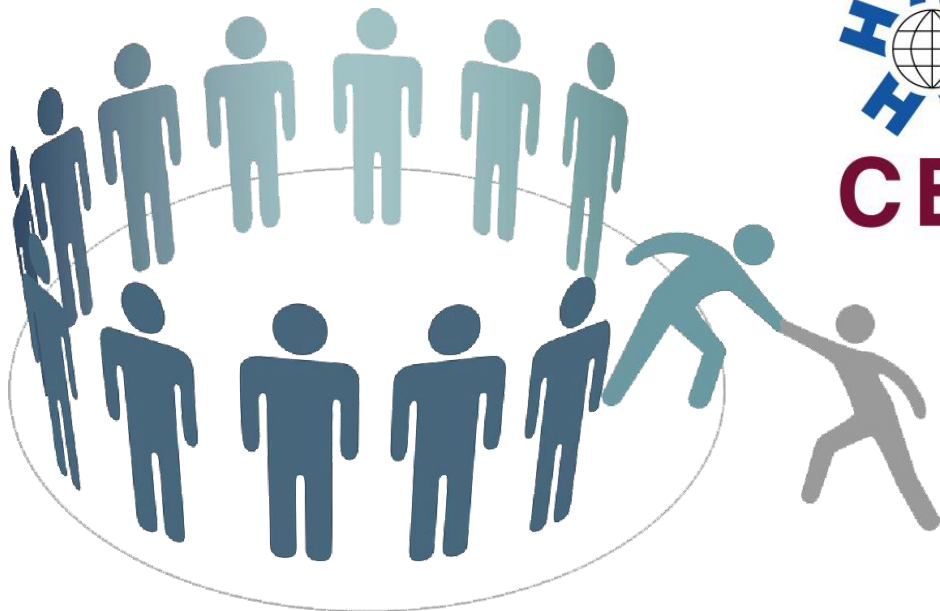
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Innovation in Leadership and Management

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Each year, the International Hospital Federation (IHF) allocates awards to new and innovative ideas in hospital and health service delivery systems. In this issue of the World Hospitals and Health Services Journal, we showcase some of the winners of the IHF innovation and recognition awards from the most recent round of applicants with a focus on innovation in leadership and management.

Business schools and schools of health policy, leadership and management throughout the world have seen an explosion in new and innovative ideas during recent years.

From hospitals to high-tech firms, innovation drives sustained success. Whether you're building a new business, transforming an established one, or leading a product R&D team, you'll need to create and nurture a culture of experimentation, with an inherent tolerance of failure, and innovation thereby evolving a more agile business.

According to a recent review by McKinsey Global Institute, almost half the jobs people are currently hired to do may be automated in the near future. Health care, despite its traditional human-labor intensiveness, is not immune from this trend. From health care delivery systems, to insurance companies to pharmaceutical and medical technology firms, harnessing robust data science processes and other techno-economic trends first drive survivability and then sustained success. To thrive and advance in this new world, health care professionals require different skill-sets, mindsets particularly around risk and ambiguity tolerance, and tool-sets that enable deeper management of the health care enterprise. Whether you're building a new business, transforming an established one, or leading a product R&D team, to succeed you need to create and nurture a culture of experimentation and innovation. Doing things the same old way won't work any longer.

Forbes Magazine recently featured an article by Robert B. Tucker which highlighted "Six Innovation Leadership Skills Everybody Needs To Master" Forbes, 2017 (Feb 9).

The following are the six critical leadership skills that will help adapt your career path in the coming years:

1. Continuously Embracing an Opportunity Mode Of Thinking
2. Being Adept at Assaulting Outdated Assumptions
3. Developing Empathy for The End Customer
4. Proactively Thinking Ahead of The Curve
5. Continuously Fortifying New Ideas
6. Being Adept at Building Buy-Ins

The articles featured in this issue of the WHHS Journal discuss some of these innovative ideas in leadership and management.

First, they include advances in precision medicine, also known as personalized medicine, which has the potential of transforming disease management based on the ability to transform massive data sets into actionable treatment plans. But, inefficiencies and stale approaches in leadership and management are often an impediment to the advancement of this breakthrough treatment approach. To overcome this shortcoming, precision medicine programs must be more closely aligned with the health care, scientific, technological and business communities to leverage results and speed progress in this growing area. This requires novel business solutions for building productive partnerships in ways previously neglected by health care and reducing bottlenecks in the development, approval and clinical use of targeted immunotherapies.

Second, today's health care leaders and managers need to respond to the intense pressure of delivering greater value and efficiency while guaranteeing high quality of care and services to broader populations. This requires health care professionals to innovate, build new capabilities and to provide quality and compassionate care in a cost-effective, coordinated, and integrated manner. All of this needs to be done in the face of shifting health policies, new expectations for improved outcomes, and dwindling resources. Simply put: we have to do more with less.

Third, many of the articles in this issue emphasize the concept of Disruptive Innovation, a concept developed over 30 years ago by Clayton Christensen from the Harvard Business School and a term that now has become widely used in the business community from Wall Street to the Silicon Valley. It encourages decision-makers to understand how disruption works and determine when to invest in successful core versus disruptive business models While the extent to which true core disruption is currently occurring in health care may be debate, the convergence of multiple change forces is unmistakable and unparalleled in recent history.

The International Hospital Federation is committed to working with its membership in fostering a positive leadership and management approach focused on harnessing such disruptive innovation, while ensuring quality care for patients.

Introducing Value-Based Healthcare in the Oral Health Sector

A new approach to improve oral health outcomes

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ABSTRACT: Dental Health Services Victoria (DHSV) is transitioning to a model of care that reflects the principles of value-based healthcare. By co-designing a new system in partnership with our consumers and staff, we are driving better health outcomes and experiences for clients. In February 2017, we started developing a model for value based oral healthcare and in October 2018, we commenced our proof of concept at The Royal Dental Hospital of Melbourne. Client and staff feedback has been overwhelming positive thus far indicating that we are on our way to creating an oral health system that improves the health outcomes that matter to clients.

As the lead public oral health agency in Victoria, Dental Health Services Victoria (DHSV) is transitioning to a model of care that reflects the principles of value-based healthcare. By codesigning a new system in partnership with our consumers and staff, we are driving better health outcomes and experiences for clients.

We are thrilled that our work towards introducing value based oral healthcare was recognised as the Gold Winner of the International Hospital Federation (IHF)/Dr Kwang Tae Kim Grand Award in the 2018 IHF Awards. We look forward to continuing to share our experiences with the health community and learning from other innovations in this space.

The need for change

There is an estimated 2.46 million Victorians were eligible for public dental services (41 per cent of the population) (1). Just one in four eligible people accessed public dental services in 2015-16, with another six per cent of eligible people waiting for access (1). There is also an indication that a sizable proportion of eligible people seek private dental care (1), the reason for which is not apparent, but is important to explore.

People who access public dental care in Victoria have more disease and fewer teeth than the general population and are less likely to access services than the general population. And when they do access care, it is not always focussed on achieving better health outcomes.

Our clinicians had become disillusioned by the lack of

impact they were having in improving health outcomes especially given most dental disease is preventable. At the same time, our consumers felt frustrated with the difficulty in accessing patient-centred care and felt that no one was listening to them.

We also discovered huge variations in the services provided across the public dental sector. The variation in topical fluoride treatments was 14 times while the variation in the provision of root canal treatments was also 14 times.

We wanted and knew we could do better.

A new model of care

In February 2017, we started developing a model for value based oral healthcare. We hosted a series of workshops with academics and researchers, clinicians, senior management and consumers. We worked with them to map out the current state of emergency and general care at The Royal Dental Hospital of Melbourne (RDHM). We then mapped out the ideal state (what it would look like with no financial or operational restraints) followed by a more realistic future state.

The new model focussed on five key areas: achieving the best health outcomes at the lowest cost, creating a patient-centred system organised around what clients need, ensuring the right services are being provided by the right person at the right locations, integrating care across separate facilities, and measuring outcomes and costs for every patient.

DHSV recognised the Model of Care could not be implemented without substantial organisational change and

implementing the other elements of Porter and Lee's (2) value-based healthcare model. With consumer and workforce co-design DHSV developed its own Value Based Health Care Model. The key central enablers of the DHSV Model are Consumer and Workforce Engagement and Co-design. The Model consists of eight components, which include the six as defined by Porter and Lee (2). A seventh component related to Culture and Capability was added to clearly articulate the substantial change required to implement the Model across the whole health service. An eighth component dedicated to Population and Settings-based Interventions was also added. This signifies the importance of population level prevention programs in improving oral health of the community – and shows the breadth of such programs provided by DHSV across Victoria.

information is easy to understand and preferably provided in their language. We collect information on the health outcomes that matter to them and use the information to design their care plan.

Co-production of the care plan: Consumers are involved in the development of their dental care plan. Everyone's responsibilities, goals and timeframes are clear. Consumers feel supported by their family and carers and receive accurate information when asking questions.

Education and care for better health: Consumers are better informed about their health and what they can do to improve it. All oral health care is evidence-based and focuses on maximum prevention as well as minimal and early intervention.

Preventive practice: Our prevention efforts are population-based and place-based. Modifiable risk factors are addressed

FIGURE 1: DENTAL HEALTH SERVICES VICTORIA VALUE BASED HEALTH CARE MODEL

Source: Dental Health Services Victoria (2018)

Models of Care

The DHSV Models of Care are focused on:

Improved consumer access: Before consumers arrive at the clinic, they receive comprehensive information so they know what to expect and where to go. Their care is coordinated and efficient, respectful of their culture and language and they have control over what happens to them.

Comprehensive assessment: Consumers spend time being educated on how they can best improve their oral health. All

prior to treatment commencing and we only focus on interventions that improve health outcomes.

Enabling technology: We use technology to make life easier for our consumers and staff. Digital radiography is available and all patient information is electronic. We use artificial intelligence to help in our decision-making.

Patient-centred care: We offer flexible appointments where all members of the family can be seen at the same time. We work in partnership with families to implement healthier

choices and better dental hygiene practices.

Engaged staff: Staff feel empowered to improve the way we do things and understand what we are trying to achieve. All members of the dental team work to their full scope of practice with a passion for patient safety and improving health outcomes.

Our new model will continue to evolve but we will continue to keep the goal in sight – creating an oral health system that improves the health outcomes that matter to clients so they can live happier and healthier lives.

Proof of Concept

In October 2018 a trial or proof of concept was commenced to test the processes that have been developed for a General Care Model of Care and many other elements of the DHSV VBHC Model. The proof of concept has a defined team of Dentists, Oral Health Therapists, Oral Health Coaches Dental Assistants and Administrative support working with clients requiring general dental treatment. There is a small implementation team to support the Proof of Concept team to assess and modify processes and systems. The proof of concept is designed to test and enhance the following:

Model of Care

DHSV Individualised Interventions – to test and refine all the products developed for the Model of care including:

▌ Format and content of the introductory session
▌ Risk assessment tools and health & social history questionnaires
▌ Clinical Pathways and Clinical Guidelines
▌ Standard operating procedures

DHSV Population or Settings Based Interventions – work will be undertaken as we learn about measuring outcomes to define the outcome measures that could be used for our preventative health programs and community-based programs.

Culture and Workforce – The on-boarding and training tools and processes will be evaluated as will the team building process.

Measure Outcomes and Costs – The costing system will be developed and tested along with the data capture at client level.

Funding Model – The funding model which is currently a broad concept will be refined as outcomes and risks are identified.

Data Collection and Evaluation – There are multiple data elements being collected, at the staff, client and system level including the ICHOM data set, staff activity and engagement. These data sets will be refined as we progress.

Integrate Care Across Providers and Systems – there is currently no activity planned against this segment as part of the Proof of Concept other than to define what resources DHSV may need to assist in the integration of care for the client groups we are treating.

ICT Platforms – Fields are being added to the patient administration and medical record system (Titanium) to enable electronic data capture which will provide information for the Oral Health Electronic Record requirements as we progress

to develop this new tool.

The proof of concept will be completed by March 31st 2019. With the learnings from the proof of concept models of care for emergency care, special needs dentistry, teaching clinic and community child dentistry are currently in development.

In the first 6 weeks of the proof of concept a total 134 clients have been enrolled in the program, 96 of those have commenced their active course of care with 16 having completed this active phase and progressed to the supportive care pathway.

Preliminary findings from the PoC mixed methods evaluation are predominantly positive. Client and staff feedback indicate the VBOHC model is a change for the better. There has been an increase in preventive care and a reduction in the provision of low-value dental treatment. Key successes include the engagement of clients and staff in co-designing the VBOHC model and the collaborative partnerships created between clients and clinical team members. While the evaluation is ongoing, it is anticipated that VBOHC will boost service cost-effectiveness. Incremental roll out of VBOHC across RDHM and Victorian public dental services is planned for 2019/2020.

Biography

Susan McKee RN, BSC (HMS), MBA, GAICD, is a Registered Nurse with over 35 years in the health sector. During this time she has worked at a range of organisations including public, not-for-profit, privately owned and the charitable sector.

Her roles have included both clinical and organisational leadership as a Nursing Director, Chief Operating Officer and Chief Executive.

The author reported no conflict of interest.

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Metro South Health Service Queensland - Our Transformation to Australia's First Digital Health Service

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ABSTRACT: Metro South's transformation into Australia's first digital health service was a large scale and highly complex task, requiring massive clinical change while ensuring the highest levels of safety and quality for patients. The project exemplified the innovative use of ICT to achieve better connected, more efficient, integrated, and safer care. The integrated electronic medical record (ieMR) program of work commenced in 2015 at Brisbane's Princess Alexandra Hospital (PAH) being the first tertiary public hospital in Australia to replace paper-based medical records. The record automates uploads of observations and vital signs from patient monitoring devices, allows efficient electronic ordering of radiology and pathology tests; and provides decision support for clinicians in prescribing, verifying and administering medicines to our patients.

Introduction

Metro South Hospital and Health Service (Metro South) facilities, service an estimated 23 per cent of Queensland's population across five major hospitals and several health centres throughout the Brisbane south, Logan, Redlands and Scenic Rim regions. Metro South services an estimated population of 1 million people, employ more than 14,000 staff and an annual operating budget of AUD $2.3 billion. Providing acute medical, cancer, surgical, rehabilitation, maternity, cardiology, orthopaedics renal, and other specialty services for both children and adults, the health service embarked on an ambitious project to roll out the integrated electronic medical record (ieMR) across all hospitals and facilities.

The implementation of a state-wide ieMR was driven by the vision for a patient's record to be available and accessible at any time by Queensland clinicians (PWC, 2016). The business case for a digital hospital was supported by an upward trend in the increasing cost of health service provision both globally and locally (AIHW, 2016; PWC, 2016). Extensive review of literature, options analysis and independent reviews consulted by PricewaterhouseCoopers (PWC) concluding the recommendation to implement the Cerner Millennium solution across all Metro South Hospital and Health service facilities (PWC, 2016).

The Metro South Digital Hospital implementation aimed to achieve:

- Transformation of the hospitals in Metro South to digital hospitals in a staged approach designed to ensure patient safety and staff proficiency, while reducing disruption to the hospital. PAH commenced as an exemplar site with a two-stage implementation, first a stage in late 2015 and second stage in early 2017; Metro South built upon and consolidated the Digital Hospital Project Team's experience and expertise to deliver the digital hospital system as a single stage/full stack implementation to Logan Hospital (late 2017) and Beaudesert Hospital (early 2018); followed in mid-2018 by single stage/full stack delivery to QEII Hospital, Redland Hospital and Wynnum Health Service.
- PAH as the first public adult facility to achieve HIMSS Electronic Medical Record Adoption Model (EMRAM) Stage 6 – the third hospital in Australia to achieve this in June 2017.
- Better outcomes being achieved for patients including fewer adverse effects due to medications errors, reduced lengths of stay, earlier identification of deterioration, reduced hospital-acquired pressure injuries, fewer readmissions after discharge, and reduced healthcare associated infections.
- Increased productivity and support achieved for clinicians due to real time patient information being available at the point of care, built in alerts and information to assist

clinical care decisions, streamlined shift handovers and faster access to patient information systems.

I   Greater efficiencies delivered for the overall health service with reductions in costs associated with drug administration, clinical forms.

I   Long term accumulation and analysis of complete, comprehensive and quantified data regarding patient care outcomes, clinical workflows and hospital operational costs across the health service; using EMRAM as an effective benchmarking tool, providing an IT strategy road map to achieving clinical and operational excellence and leading to informed decisions about the provision of health care services in the future.

Exposition

The Metro South Digital Hospital Project was charged with implementing the Queensland ieMR system into a hospital for the first time. Our team took an innovative and strategic approach to successfully deliver major clinical change into our hospitals, without any incidence of patient harm. Specific innovations included:

I   Establishment of embedded clinical change networks at each hospital – clinical staff become super users of the system and combine their local knowledge with their newly acquired digital hospital expertise. They become not only key advocates for clinical change; they become long term support staff for the long term optimisation of the system.

I   A specific Clinical Governance Framework structured to capture all aspects of the project's impact on the hospital, providing a clinical oversight of all activities and prioritising patient safety.

I   Creative communications strategies which used multiple channels to "cut through" the clutter which is a reality of modern hospital environments. The success of the communication strategies resulted 100 percent of staff being aware of the project and trained and proficient prior to each Go Live. In 2016 the digital hospital communications strategy won Australia's highest public relations awards for Internal/Change Management Communications and Comprehensive / Major Change.

The commitment by Metro South's management and staff to applying innovation to achieve best practice health care resulted in the Queensland Government designating PAH as the Queensland exemplar site for the initial implementation of the ieMR.

Throughout the delivery of the digital hospital system across Metro South, our staff have embraced the significant clinical change required to realise the benefits of the system. Staff commitment underpinned the Digital Hospital Clinical Change Network to support the implementation. Now each hospital has a sustainable and comprehensive foundation of hospital-based expertise and support. This including Australia's first rural digital hospital, Beaudesert Hospital.

Infrastructure

As health care continues to change, so do the requirements of the infrastructure in which it is delivered. To support the digital hospital implementation, since 2014 all MSH facilities have participated in extensive consultation with key infrastructure experts, clinicians and relevant stakeholders to redesign work environments. All wards and departments now have access to various medical devices and IT equipment, all connected to the ieMR.

Metro South Health's key principle when planning and delivering these infrastructure upgrades was to ensure quality patient care with minimal impacts and costs to the organisation and its staff. A key focus was to ensure the infrastructure works implemented today would be sustainable for future workflows. Each department was individually assessed to meet safety standards, to ensure ease of movement for clinicians and to determine whether future digital workflows would work with their current configuration.

All facilities received extensive electrical infrastructure upgrades to meet the demand for connectivity with the digital hospital devices. The infrastructure works were completed with immense speed, while maintaining patient safety and comfort, infection control and the highest building standards. A team of device experts was deployed to integrate the new technology following the electrical works.

A clinical change project

The success of becoming Australia's first Digital Hospital project has depended largely on it being treated as a clinical change project — not just an IT system implementation. To engage clinicians in the project, the complex and technical nature of the IT components had to be transformed into a language and context which resonated with clinicians and staff who were not IT specialists. In addition, when delivering such a large-scale change, the safety of patients needed to remain the highest priority. The implementation was achieved with zero patient harm, demonstrating the success of clinically driven processes for tailoring the rollout.

As with any large-scale change in a healthcare organisation, the digital implementation necessitated changes to models of care. For clinicians, it changed the way they thought about healthcare systems; it changed the way care was provided, the engagement between patient and clinician; and it changed multidisciplinary team interactions. For these reasons, there was no single 'one size fits all' model that could be applied throughout the transformation — changes had to be designed and delivered in close consultation with each unique clinical area.

Metro South Health also needed to ensure that patients understood the benefits of the digital platform, such as better monitoring to alert clinicians faster to deterioration, while being reassured that the security of their personal data was safe.

Lessons learnt

The implementation has provided Metro South Health and its staff with opportunities for growth, innovation and continuous enhancements to the way the organisation provides patient care.

Crucial to the success of the project was the leadership role of clinicians. Having clinicians deeply embedded in the project ensured staff not only understood the role they played in the

go live process, but also in realising the benefits to patient care through the ongoing use of the digital hospital system. While there was limited capability to change the functionality of the system, there was a significant opportunity to understand clinical workflows in each hospital and how they might be redesigned to be best supported by the ieMR.

This included a stringent, hospital-driven clinical governance framework that was essential to ensuring the safety of patients during the transition period and beyond. During each hospital's go live phase, daily clinician meetings were held to compile feedback from all levels of the hospital, to conduct a 'triage' on any issues which arose and to plan and deliver solutions to address those issues. Critical, also was the unswerving support of the board and senior executive in providing a successful outcome.

Metro South Health is looking forward to seeing the ongoing benefits that the ieMR will bring to patients across the health service as we provide a connected information service between our facilities.

Conclusion discussing health systems and/or policy implications.

The integration of the ieMR in Metro South Health has had a significant reduction in impact of medication errors, emergency readmissions and reduction in hospital acquired pressure injuries. Prior to the Metro South Health implementation, there was considerable literature supporting the benefits of the ieMR however, primarily qualitative (Nguyen, Bellucci and Nguyen, 2012).

Since becoming a digital health service, Metro South Health has seen a significant benefit realisation at PAH for example, emergency readmissions were 17 per cent less within 28 days of discharge, drug costs per weighted activity unit were 14 per cent lower, hospital-acquired pressure injuries dropped by 56 per cent, healthcare associated infections lessened by 37 per cent, while the early identification of deteriorating patients increased by 59 per cent. Specific measured benefits data is detailed in Appendix 1. PAH Digital Hospital Benefits Data.

The benefits realisation continues to be tracked and measured at all hospitals in the Metro South Health service. The continuance of tracking the benefit indicators has commenced with 6 month post go live data at Logan and Beaudesert Hospitals with Queen Elizabeth II Jubilee Hospital and Redland-Wynnum Hospital to be tracked in mid 2019. To date PAH, Logan and Beaudesert hospitals are reporting improvements in patient throughput, medication management and medication management of administration and monitoring.

I Patient throughput of outpatient occasions of service has seen an increase across PAH (16.7%), Logan (24.0%) and Beaudesert (6.1%) Hospitals.

The electronic medication management provides more accurate information with clinical decision support, for example, alerts for drug interactions or allergies at the time of ordering which assists in the reduction of human error in the medication management process.

I Reportedly, the medication errors causing adverse drug events reported incidents related to administration and monitoring have reduced across the PAH (7.5%), Logan (10.9%) and Beaudesert (7.14%) Hospitals.

I Along with the increase in pharmacy interventions in prescribing/transcription reporting, 86 per cent (PAH), 28 per cent (Logan) and 32.58 per cent (Beaudesert).

Other benefits include improved sharing of information among clinicians particularly in multi-disciplinary care teams, more efficient handovers at shift change, and high levels of endorsement of radiology results. Metro South strives to be the fore front of health care and deliver. As Australia's first digital health service, we're uniquely placed to lead the nation in new and innovative ways of providing care.

By improving that precision of medicine and the reliability of that care we're seeing fantastic results in our hospitals. That reliability translates not just into better care, it translates into more cost-effective care.

Biographies

Dr Stephen Ayre has worked in senior management roles across health, including community health, medical superintendent and medical services. He worked as the Executive Director of Medical Services at The Prince Charles Hospital from 2008 to 2014. He was appointed as Executive Director, Princess Alexandra Hospital and QEII Jubilee Hospital Health Network in May 2014, prior to his appointment as Chief Executive in July 2017.

Cameron Ballantine is a Registered Nurse with post graduate qualifications in Intensive Care. His most recent position has been leading the implementation of the Digital Hospital/ieMR for Metro South Health. Cameron's digital experience includes service delivery transformation to support changing models of care associated with digital hospitals. This includes significant experience in leading implementation of data analytics and predictive modelling to support patient care.

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APPENDIX 1: PAH DIGITAL HOSPITAL BENEFITS 2018

Princess Alexandra Hospital

Digital Hospital Benefits 2018

A benefit is a measurable improvement resulting from a change that is perceived to be an advantage by a stakeholder.

The benefits associated with the digital hospital system at PAH have been achieved because the hospital's clinical and non-clinical staff have embraced innovation in healthcare.

Early identification of deteriorating patients
Rapid Response Team calls within 24 hours of ED transfer to ward

AUG 2015 vs AUG 2018

< 50%

Drug administration and monitoring
Incidents linked to drug administration and monitoring

1 APR - 6 AUG 2016 vs 1 APR - 6 AUG 2018

> 4%

Readmissions
Emergency readmissions within 28 days of discharge

JAN - JUN 2014 vs JAN - JUN 2018

> 18%

Radiology results
Formal endorsement of ED Radiology results

DEC 2014 - MAY 2015 vs DEC 2017 - MAY 2018

< 93%

Drug Dispensing and Supply
Incidents linked to drug dispensing and supply

1 APR - 6 AUG 2016 vs 1 APR - 6 AUG 2018

> 23%

Clinical form costs
Including printing costs

MAR - MAY 2014 vs MAR - MAY 2018

> 89%

Infections
Healthcare associated SAB per 10,000 bed days

JAN - JUN 2014 vs JAN - JUN 2018

> 20%

Inpatient length of stay
Average for all admissions

JAN-JUN 2015 vs JAN-JUN 2018

< 5%

(i) This has been analysed over a longer period of time between 01/07/2014 and 30/06/2018 and the reduction in inpatient length of stay has been found to be *statistically significant.*

Drug costs per WAU
Drug costs per weighted activity unit

APR - SEP 2016 vs APR - SEP 2018

> 11%

(i) Fluctuations may occur due to changes to PBS and high costs/section 100 drugs.

Reported Hospital Acquired Stage 3 and 4 pressure injuries
No. of patients with stage 3 and 4 pressure injuries per 1000 bed days

JAN – JUN 2014 vs JAN – JUN 2018

> 50%

(i) This has been analysed over a longer period of time between 01/07/2014 and 30/06/2018 and the reduction in stage 3 pressure injuries has been found to be *statistically significant.*

OUR Digital Hospital PRINCESS ALEXANDRA

Other benefits expected from the Digital Hospital will be tracked over time. Date ranges selected for comparison use seasonally equivalent pre and post go-live periods based on the best available data and exclude the period when digital hospital was implemented, to isolate impacts arising from this change. Printed copies of this document are considered uncontrolled. Published 23 November 2018.

2018

Bed Management System of Sant Joan de Déu (BEDMA-SJD), an Innovative System for Efficient Management of Healthcare Processes

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ABSTRACT: To reduce hospital overcrowding and its negative effects, we use a bed management model that takes into account the hospital as a whole, harmonizing patients scheduled for surgery and those from the ED. We use an algorithm that predicts the beds available on a daily basis, 24 hours in advance, using real-time data from EHR combined with an estimate of inpatient discharges and admissions from the ED based on recent historical data. When the formula predicts a situation where no action is needed, the probability that reality will behave as predicted is well above 90%. However, if it predicts that a threshold will be exceeded, the measures adopted avoid it in more than 60% of the days. We manage scheduled patients throughout the year modulating the overall activity and the proportion of outpatient surgeries.
Therefore, we can plan the use of beds for each group in an interconnected way and thus greatly reduce days with overcrowding.

Introduction

In order to reduce hospital overcrowding and its negative effects on the safety and quality of care provision, we use a management model that takes into account the hospital as a whole. There is abundant scientific literature that analyzes this issue and it is well established that the main factor that determines overcrowding in emergency departments is patients staying too long in the inpatient area due to the lack of beds and not so much the alleged "inadequate emergency care." The key is to understand that the groups of patients "competing" for beds are either those scheduled for surgery or medical admission and those that come from the Emergency Department (ED) and the Pediatric Intensive Care Unit (PICU).

In the particular case of our hospital, with its peculiarity of being a children's hospital of international renown, from 2012 onwards it was decided to intensify the effort to increase high complexity activities. This fact determined the risk that, without there being a parallel increase in the number of beds,

overcrowding would increase. Especially in the ED, which has an Observation Area with 6 beds for stays of less than 24 hours.

Within this framework, our current bed management system was conceived and implemented progressively; and it is now the centerpiece of our operational management. In 2015, we already had all its components at full capacity. Since then, we have been testing and re-evaluating the system, introducing adjustments that have led to the good results presented here and help us a lot in our day to day work.

Discussion

The main objective of the bed management system is to minimize the periods of saturation, which result in significant alterations in the ED, the surgical area, the PICU and the inpatient area. In this way, we try to reduce the following:
- In the Emergency Department:
  - The prolonged stay of patients in the ED due to the lack of beds in the inpatient area.

- The worsening of the evolution of diseases that are more time-dependent.
- Increase in complaints and claims.
- Increase in costs.

I In the Surgical Block:
- Surgery suspensions on the last day due to the lack of beds.
- The prolonged stay of patients in the surgical block due to lack of beds in the inpatient area or in the PICU.

I In the Pediatric Intensive Care Unit:
- The prolonged stay of patients in the PICU due to lack of beds in the inpatient area.
- The increase in infectious complications associated with prolonged stays in the PICU.

I In the Inpatient Area:
- The difficulty to admit all the patients as required from emergencies, the surgical area, the PICU and all the other activities scheduled for the day.
- The increase in the hospital stay of patients admitted from emergencies due to delay in providing the adequate care deriving from overcrowding in the ED.

Our model is based on the assumption that the problem of overcrowding is global throughout the hospital. Therefore, we consider the process as a whole. We mainly take advantage of two simple, easily replicable tools, which at the same time are innovative since we use them in a coordinated way:

I **QUIRPLAN**: This is a computer tool that integrates diverse Electronic Health Record (EHR) information related to the scheduled surgical activity. It facilitates daily, weekly and annual planning. It allows the establishment of a maximum number of daily beds that can be used for surgeries. This value is variable throughout the year depending on the prediction of the volume of patients admitted from the ED. This allows making compatible the need of beds for patients admitted from the ED and ensuring that planned activities are carried out annually. We manage scheduled patients throughout the year, modulating the overall activity and the proportion of outpatient surgeries. This tool facilitates reprogramming within the week (for the following week) so that we can achieve a balanced situation for each day. It allows the closure of the surgical program one week in advance, in such a way that last minute changes are reduced and a more accurate and balanced planning can be made.

I **PREDIL** Formula (Prediction of Beds Availability): We use an algorithm that predicts daily beds available at 7:00AM, 24 hours in advance, by the difference between admissions and discharges predicted. First of all, it uses real-time information from EHR: number of available inpatient beds, number of admissions needed for the scheduled surgical and medical activity, number of patients located in emergencies pending admission and number of patients in the PICU pending transfer to conventional hospitalization. Additionally, a forecast is made of the other variables necessary to obtain the expected balance sheet for which there is no certainty:

FIGURE 1: WEEKLY SURGICAL PLANNING EXAMPLE

Source: BI software system, Sant Joan de Déu Barcelona Hospital

TABLE 1: SCHEME OF THE PREDIL FORMULA ALGORITHM

Forecast 24h in advance		Type of variable
Beds available in Moment0		Real Data
+ INPUTS	Admitted to the surgical area without previous bed	Real Data
	Scheduled admissions until next day at 7:00h	Real Data
	ICU patients pending transfer	Real Data
	Patients in Emergency Room pending admission	Real Data
	Admissions from Emergency Room estimated for the next 24h	Forecast
- OUTPUTS	Estimated Discharges for the next 24h	Forecast
Beds prediction		Forecast

Admissions from Emergency Room estimated	
Forecast uses an algorithm that ponders, based on the day of the week:	
Work days:	last 3 equivalent days of week and last 3 labor days
Weekend or off days	last 3 equivalent days of weekend or off days

Estimated Discharges for the next 24h	
Forecast uses predischarge record if it exists or compares the current stay with LOS standards for each incoming diagnose and ponders this prediction with:	
Work days:	last 3 equivalent days of week and last 3 labor days
Weekend or off days	last 3 equivalent days of weekend or off days

Source: Authors

number of inpatient discharges and number of admissions from the ED that will occur during the next 24 hours. This estimate is constructed by combining recent historical data with information extracted from EHRs (inpatients with a pre-discharge record and inpatients that match or exceed the expected stay in their diagnostic group) in such a way that a prediction is obtained that uses

the combination of variables that will allow the best adjustment. We have worked hard iteratively to find the combination of variables and weights assigned to each piece of data that will best fit the predictive function.

Given our characteristics, we have found that the day of the week has a significant explanatory weight as well as the recent past. We also introduce adjustments to the model to capture the

TABLE 2: EXAMPLE OF PREDIL FORECASTING DAILY OUTPUT

Available Beds Forecasting

Available Beds Prediction for 03/02/18 at 07:00h

CALCULATION DATE	Beds functioning	INPUTS		OUTPUTS		Available Beds Predicted
02/02/2018 07:00	156 Variation vs yesterday: -3	Admitted to the surgical area without previous bed Scheduled admissions until next day at 7:00h ICU patients pending transfer Patients in Emergency Room pending admission Admissions from Emergency Department estimated for the next 24 h	4 19 2 1 21	Available Beds Estimated Discharges for the next 24h	22 48	23

→ BALANCED SITUATION: NO ACTIONS NEEDED

Available Beds Forecasting

Available Beds Prediction for 05/04/18 at 07:00h

CALCULATION DATE	Beds functioning	INPUTS		OUTPUTS		Available Beds Predicted
04/04/2018 07:00	154 Variation vs yesterday: 24	Scheduled admissions until next day at 7:00h ICU patients pending transfer Patients in Emergency Room pending admission Admissions from Emergency Department estimated for the next 24 h	26 1 3 21	Available Beds Estimated Discharges for the next 24h	11 31	-9

→ UNBALANCED SITUATION: A MEETING IS HELD AND ACTIONS ARE TAKEN

Source: Authors

trend of increase or decrease in which we currently stand.

We have defined a threshold given our established structure and when the forecast exceeds it, we gather a group of professionals to take appropriate action, such as increasing available beds, changing surgical activity with admission for outpatient surgeries, etc. Using the two tools presented in a coordinated way we can be more efficient in allocating resources. Therefore, we can plan the use of beds for each group (scheduled and ED admissions) in an interconnected way and thus reduce considerably the days with overcrowding and the suspension of the activity derived from it.

We have established the evaluation of the results of the model in two ways:

❙ **Reliability of the PREDIL formula**
  - When the formula predicts that the balance of patient inputs and outputs will create a balanced situation (maximum of 6 patients without bed in our particular case given our set infrastructure), the prediction is successful on 97% of the days.
  - In the event that the formula predicts a deficit of more than 6 beds, since we carry out various corrective actions we can avoid this situation in 62% of the cases.

❙ We also have evaluated different hospital **overcrowding indicators**: despite the increase in the complexity of inpatient activities, with an increase in the average weight of our hospitalization case-mix (measured with DRG APR32) from 1.0627 in 2011 to 1.1818 in 2017 and the increase of ED activity (From 93,738 ED visits in 2011 to 104,099 ED visits in 2017), overcrowding indicators have improved or remained stable. The main results are shown in the table below:

TABLE 3. RESULTS	
1. % patients attended in ED by a doctor within adequate time range depending on Triage Level:	• Level 2 Triage <15 minutes: 71% in 2011; 78% in 2017 • Level 3 Triage <30 minutes: 65% in 2011; 65% in 2017
2. % patients visited in ED with episodes of duration >4h:	• 17% in 2017
3. EDWIN index*: (we measured the EDWIN index every hour in 2017) * Emergency Department Work INdex	• 7 days out of 365 with at least a measurement of the EDWIN index >2 (overcrowded) • 45 days out of 365 with at least a measurement of the EDWIN index >1.5 (busy)
4. Surgical operation suspensions on the last day due to the lack of conventional beds:	• Only 5 in 2017

Source: Authors

The BEDMA-SJD has had a very good level of acceptance by clinicians, managers and owners and has also had a great impact on patients:

❙ Clinicians value the effect of diminishing overcrowding in their working areas, both for the qualitative improvement of the care they provide to their patients and for the improvement of their working conditions, as stated in the good results of the internal employee satisfaction survey.

❙ The introduction of the new model met initially with some resistance from the managers, not those who pushed it, but mostly those front-line managers who had their usual work style modified. Nevertheless, the positive effects of change have been able to minimize and overcome this fact and have now become a valued tool for all.

❙ The property of the hospital has valued very positively the fact that a very important increase in the complexity of hospital activity without growth of the hospitalization structure has managed to avoid the appearance of serious hospital overcrowding effects.

❙ Patients and families value the reduction of waiting times for receiving effective treatment and improvements in their comfort resulting from reduced overcrowding. This can be quantified with the good results shown by the Net Promoter Score indicator (NPS). In 2017, it was 60 for the Emergency Department and 80 for the Inpatient Area, much higher than usual in our sector.

The successful experience we have discussed could easily be replicated in other hospitals. Those that could benefit the most are those that combine a large amount of urgent admissions with scheduled surgeries, especially those who have more problems with hospital overcrowding.

On the other hand, predicting bed availability in advance, in case of sharing it with the healthcare administration, would allow the regulator to coordinate the hospitals in a given area and take corrective measures in advance regarding the time when saturation is anticipated.

Conclusions

The overall effort made to implement our bed management system has been well worth it, because we have achieved excellent results.

We benefit a lot from a prediction tool focused on helping us decide whether to take corrective actions. We have stressed decision-making help over accuracy.

We get great value from anticipating overcrowding situations so we can take appropriate measures to reverse them. However, we value even more the effect of preventing overreaction and making decisions when they are not needed.

Suspension of scheduled activity is greatly reduced because the little extra time we gain thanks to the prediction allows us to introduce minor changes and adapt to eventualities.

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Ricard Casadevall Llandrich, Health Economist, is fully engaged with clinical and healthcare management. He is focused on data analysis, visualization, data mining, predictive analytics and clinical outcome measurement, and is actively contributing to resource planning, performance monitoring, economic evaluations and clinical decision-making support. He has extensive knowledge in data storage and analytics software.

Josep Lluís Garcia is a medical manager with extensive experience in the operational management of health services. He has held various positions from Head of the Emergency Department to Medical Director. His interest is in predictive data for better resource planning.

Daniel Ormazabal Kirchner is a fully qualified IT engineer with extensive knowledge of many technologies and special expertise in the entire data analysis process: data extraction, transformation and loading processes ETL (what data to extract, from where, how, transform and load), data modeling, algorithm design and visualization.

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An Innovative Culture and Technology to Advance Excellence in Mental Health Care

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ABSTRACT: This article describes the implementation of electronic health records (EHRs) in a specialty mental health care facility. With support from the Board of Directors and Senior Management Team, this project achieved its goals of 1) advancing best practices, 2) enhancing safety and quality of care, 3) standardizing care; 4) enhancing patient experience; and 5) creating efficiencies. Modules were customized to the specific needs of the mental health population. Our work continues to ensure sustainability, partner with organizations for a shared EHR system and create greater efficiencies through innovative projects using data analytics.

Introduction

Electronic health records (EHRs) have the potential to provide important benefits to healthcare organizations, including more complete documentation, improved safety and efficiency and facilitated information sharing and co-ordination (McGinn, 2016; Menachemi and Collum, 2011). While the literature shows mixed results (Menachemi and Collum, 2011), well-planned strategically implemented EHRs consistently show benefit to the organization and service users (Amarashingham et al, 2009). To date, most of the focus has been on primary and acute care, where quality of care has been an important metric for hospitals to report, making it the majority of literature describing the effects of EHRs on service user safety and clinical outcome, both of which are well supported.

In mental healthcare, however, there is a lack of consistent outcomes and tools embedded in standard EHRs (Kilbourne et al, 2018). As a mental health hospital, we had the added challenge of developing and customizing modules to adequately capture the unique health and social service documentation needed for this population. Ontario Shores Centre for Mental Health Sciences (Ontario Shores) is dedicated to providing recovery-oriented care; that is, providing services to empower service users to live a meaningful and purposeful life, despite potential ongoing symptoms. Thus, we were in the paradoxical position of working to standardize care for clinical excellence, while facilitating individualized treatment to enable staff to support service users in achieving their personal goals.

Ontario Shores is a tertiary level public hospital specialized in providing assessment and treatment services to people living with complex and serious mental illness. Our facility is comprised of 16 specialty inpatient units, 6 of which are part of the provincial forensic mental health services, with the remaining 10 serving adolescent, geriatric, and general adult populations. We provide services for more than 75,000 outpatient visits per year through both hospital- and community-based clinics. Ontario Shores began its journey to a fully integrated EHR system in 2007 and we have been paper-free since 2010. We were able to utilize some existing modules, but much of the content had to be customized for our mental health population.

With a dedicated team and strong support from the Board of Directors and Senior Management Team, we became the first mental health hospital in Canada to achieve the Health Information Management Systems Society (HIMSS) Stage 7 designation in October, 2014. One year later, we became the first mental health hospital in the world to achieve the HIMSS Nicholas E Davies Enterprise Award of Excellence for outstanding achievement by organizations who have used health information technology to substantially improve patient outcomes while achieving return on investment.

Exposition

In 2007, Ontario Shores' Board of Directors and Senior Management Team endorsed the adoption of an EHR system and transition from almost 90 years of paper-based charting. Five goals were identified at the onset: 1) advance best practices in mental health care; 2) enhance patient safety and quality of care; 3) embed mechanisms to enable standards of care and adherence to clinical practice guidelines; 4) enhance overall patient experience and satisfaction; and 5) eliminate paper records, optimize processes and create efficiencies.

In order to accomplish these goals, a clear governance structure was established to oversee all phases of the project (Figure 1). A full description of our implementation has previously been published (Riahi et al, 2017). Briefly, the Board of Directors, Senior Management Team, leadership group, clinical and non-clinical departments and teams were involved throughout the project. Working groups were established to advance key project milestones. A strong project management structure ensured that all timelines were met and budget was adhered to. As part of the readiness work, a comprehensive process involving decision-makers and over 80 frontline clinicians was completed to select the EHR platform for implementation. Clinical Informatics and Professional Practice worked closely together to design the new clinical forms, which were introduced into practice in paper form prior to EHR implementation. All staff were offered basic computer skills and specific EHR training. Champions were identified and trained to co-facilitate education sessions and support their unit. The EHR was implemented using a staged "big-bang" approach to pace the changes and ensure appropriate time was provided for staff engagement and participation. The go-live schedule is shown in Table 1.

Computerized physician order entry (CPOE) and closed loop medication administration are common modules in EHRs, which have proved to effectively improve medication ordering and administration processes in acute care (Bates et al. 1998, 1999), our organization (Riahi et al, 2017) and other mental healthcare facilities (Sulkers et al, 2018). Over the past 7 years, we've maintained a 90% or greater computerized physician order entry rate, 95% or greater medication and patient scanning rates and 100% medication reconciliation on admission and discharge. Implementation increased patient safety by reducing risk of adverse events caused by medication errors, optimized processes and created efficiencies by inputting orders through the EHR (Riahi et al, 2017).

Once the standard modules had been implemented in both inpatient and outpatient services, we were able to create innovative solutions leveraging real-time data to address our unique needs for the provision of excellent mental healthcare. In order to advance evidence-based practice and ensure this was the standard of care for all service users, we used the EHR to support the implementation, adoption, adherence to, and sustainability of clinical practice guidelines (CPGs) for schizophrenia (Fischler et al, 2016), dementia and depression. Specifically, reflex orders and decision support enabled by the EHR were key strategies to increase adherence to practices and referral to services as recommended by CPGs. After four years, adherence to the key practices (e.g., antipsychotic monotherapy, metabolic monitoring, referral to cognitive behavior therapy and referral to vocational rehabilitation) was increased from 9-153%, demonstrating the utility of the EHR in supporting best practices in mental healthcare (Fischler et al, 2016).

The EHR has enabled Ontario Shores to introduce new tools and applications to improve the quality of care, safety, and efficiency. For example, the Level of Care Utilization System (LOCUS) is a brief assessment used to support decision-making around care level transitions as a service user progresses through their recovery. Prior to our implementation, the LOCUS tool had never been used in forensic mental healthcare (Coleman et al, submitted). This initiative facilitated a decrease in re-admission rates within 30 days of discharge and a 20% increase in the number of admissions from the wait list per quarter. As such, implementation of the LOCUS tool, facilitated by a module in the

TABLE 1: ELECTRONIC HEALTH RECORD IMPLEMENTATION GO-LIVE SCHEDULE	
Go-Live Date	**Services included**
October 2009	Financial, admissions, pharmacy, material management
December 2009	Human resources, staffing and scheduling
October 2010	Inpatient services with advanced clinical applications, patient care system, imaging and therapeutic services, laboratory and physician care manager
August 2011	Outpatient services, with all modules applicable to outpatient services
2011-present	Upgrades, optimization and innovative modules to address mental healthcare needs.

EHR, enabled increased access to our services.

As previously mentioned, Ontario Shores strives to provide recovery-oriented mental healthcare, which includes empowering service users to be in control of their healthcare and recovery. The HealthCheck Portal was launched in 2014 to allow service users to safely access a portion of their personal electronic medical record through an online link (Kipping et al, 2016). Service users can now access information about their current health conditions, laboratory results, visit history and medications and can book appointments, request prescription refills and contact their clinical team. A benefits evaluation of the HealthCheck Portal showed a positive impact on the service users' sense of autonomy, increased activation and recovery scores and improved organizational efficiencies (Kipping et al, 2016). The staff also benefit from improved communication with service users and their families. To date, there are 986 registered service users and caregivers on the portal.

To become more aligned with recovery-oriented service, Ontario Shores has an ongoing goal to reduce the use of restraint and seclusion (Riahi et al, 2016). As part of our original strategy, decision support and reflexive orders were used to prompt clinicians to complete reassessments in a timely manner, remind clinicians of the service user's de-escalation preferences and prompt a timely debrief with the service user (Riahi et al, 2017). This led to a 19.7% reduction in total restraint and seclusion incidents, a 42.3% reduction in the total restraint and seclusion hours and a 38.9% reduction in the average hours per restraint or seclusion incident (Riahi et al, 2016). While these are very positive results, we wanted to be able to do more to prevent incidents from occurring. We've recently partnered with an advanced analytics software vendor to develop and test a model that uses EHR elements to predict clinical aggression and violence by service users. The predictive model used discrete and unstructured text, leveraging leading-edge machine learning and Natural Language Processing methods. While further study is needed, this innovative pilot signaled that the predictive analytics model and associated targeted patient care interventions reduced clinical aggression amongst service users at risk, thus promoting safety for all.

Advanced analytics will be an important focus in the coming years, made possible by our rich EHR data, and provide us with further insight into quality of care and patient safety. We have started with a pilot project to determine predictors of length of stay and are planning to use data mining and deep learning approaches to predict healthcare trajectories for our service users, as has been done for other chronic diseases (Osmani et al, 2018; Pham et al, 2017).

Conclusions

The EHR has allowed us to achieve our objectives of advancing best practices in mental health care, enhancing patient safety amd quality of care and overall patient experience and satisfaction, as well as optimizing process-es and creating efficiencies. At Ontario Shores, there is a continued emphasis on EHR sustainability and optimization through continuous evaluation and enhancement of existing modules. Our next goal is to create an EHR system shared among multiple organizations to further standardize care and documentation and to facilitate service user transitions between facilities. We have partnered with two large provincial mental health hospitals to create one shared EHR system that will be standardized across all three hospitals. Participation in health information exchange initiatives helps to integrate electronic patient information from across the care continuum and improve timely access at the point-of-care.

Biographies

Karim Mamdani is the President and CEO of Ontario Shores Centre for Mental Health Sciences, a public specialty hospital that provides specialized assessment and treatment services for people living with complex mental illness. His areas of focus include information management, employee engagement, financial and operational management, governance, land and building development, collective bargaining, funding systems and strategy development and execution.

John Chen is the Chief Operating Officer at Ontario Shores Centre for Mental Health Sciences (Ontario Shores). He has been instrumental in leading and establishing an Information Technology Department and guiding the implementation of systems solutions for the hospital. Mr. Chen is a chartered professional accountant and holds a Master's Degree in Accounting to go along with 20 years' experience in financial planning and management.

Dr. Ilan Fischler is the Physician-in-Chief at Ontario Shores Centre for Mental Health Sciences (Ontario Shores), Medical Director of Clinical Informatics and a Geriatric Psychiatrist. He was the Physician Champion for the implementation of the hospital's fully integrated Electronic Medical Record system. Dr. Fischler is an active researcher and educator and has provided leadership at the provincial level in the development of quality standards for mental health. He is innovative and passionate about the application of technology to advancing the mental health care system.

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Give a Life: A Corporate Social Responsibility Program for Improving Cardiovascular Pediatric Health Care in Underserved Populations in Colombia

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ABSTRACT: Congenital Heart Defects (CHD) are among the most common types of congenital diseases worldwide and the third highest cause of neonatal mortality in Latin America. For more than 20 years, and in accordance with its mission of treating underserved children affected by CHD, Fundación Cardioinfantil-Instituto de Cardiología (FCI-IC) has developed a social responsibility program called "Regale Una Vida" (Give A Life) for the postnatal detection and treatment of CHD. Currently, this Program conducts at least 12 non-profit medical brigades every year, screening around 3,000 children. In this article, we describe the achievements and challenges of the Program.

Introduction

Congenital Heart Defects (CHD) are defined as abnormalities in the function or structure of the heart or thoracic blood vessels (Schwedler *et al.*, 2011; Otaigbe and Tabansi, 2014). They are among the most common types of congenital disabilities worldwide, accounting for 35.5% of the total number of cases of congenital malformations in the United States (Egbe *et al.*, 2015) and 25.4% in Europe ([EUROCAT], 2015). Their prevalence varies from 4-10 cases per every 1,000 live births worldwide (Van der Linde et al., 2011).

In Colombia, the incidence of CHD is 8 per 1,000 live births, amounting to one of the leading causes of infant death (D. *et al.*, 2011; Hoffman, 2013; Sandoval, 2015). Around 70% of these children will require medical or surgical treatment during their first years of life. Disparities in the health system framework based on social determinants prevent the delivery of appropriate treatment, generating an impact on equity in health and well-being (Solar and Irwin, 2007); thus, 30% of these children may die in their first years of life. Appropriate diagnosis and treatment reduce the impact of CHD in children and on their families, especially in the more severe cases; prognosis is clearly improved by strategies that encourage early detection and treatment (Juan F *et al.*, 2005; A. *et al.*, 2010).

Fundación Cardioinfantil-Instituto de Cardiología (FCI-IC) was conceived with the mission of treating children with CHD, no matter their social or economic background. Although cardiac procedures for CHD are challenging, surgeons and pediatric cardiologists at FCI-IC have achieved outstanding

clinical outcomes for these children, on a par with those obtained by institutions in high-income countries.

To support its mission and provide medical services for children from low-income families, FCI-IC has developed a successful and sustainable operative model based on high-quality health care and focused on patient security and wellbeing, which is attractive for insurance companies and third-party payers. Supported by fundraising strategies, creative and innovative hospital space use, planning, acquisition of high technology, economy of scale in the acquisition of supplies and continuous professional training for our medical staff, promoted by well recognized universities, FCI-IC is today a sound hospital complex of 70.000 square meters that provides state-of-the art care to high-complexity patients from Colombia and the region, contributes with better knowledge of CHD through research and has increased its social programs to help in closing the equity gap for underserved children in Colombia.

Background

For over 40 years, the FCI-IC of Bogotá has had the mission of reaching the underserved population "to treat all children with CHD in Colombia, independently of their economic or social background" (Instituto de Cardiología, Fundación Cardioinfantil, 2012). In addition to pursuing this goal in the Bogotá urban and surrounding areas, for over two decades FCI-IC has conducted yearly non-profit medical brigades in at least 12 different Colombian cities, to screen, diagnose and provide free-charge treatment to children with CHD. Although currently there are pediatric cardiac surgery centers in 8 Colombian cities, our institution still provides care for the most significant number and the most complex cases per year in the country (Sandoval *et al.*, 2010).

During the '70s, physicians Camilo and Reinaldo Cabrera, once they came back from the United States following their studies in medicine, had the initiative to create a medical institution to provide health services to low-income children affected by CHD. In 1973, the Cabrera brothers founded FCI-IC to improve health access for vulnerable populations. In 1980, they began to construct the first buildings in Bogotá, with the appropriate technological and physical infrastructure to provide high-quality health service for the medical or surgical treatment of children depending on their medical needs. In the early '90s, the FCI-IC surgery registries reported approximately 4,000 pediatric cardiovascular surgeries (Fundación Cardioinfantil, 2004).

Over the ensuing years, medical brigades were established, with an average of 10 to 12 per year. These are determined by community and societal alliances, as well as physicians and regional stakeholders that can facilitate access to all services that FCI-IC can provide. At present, these non-profit medical brigades are carried out under the *Give a Life Program* (Figure 1).

Pediatric cardiology brigades' structure and functioning

A multidisciplinary team (cardiologists, nurses, pediatricians, social workers, medical doctors and trained volunteers) systematically visit 10-12 cities in Colombia on a yearly basis, to screen, diagnose and provide care for children with CHD (Figure 2). Children and their families are invited through communication campaigns (Figure 3) organized in these cities and surrounding municipalities and rural areas. Anyone with a suspected heart problem may attend (Instituto de Cardiología, Fundación Cardioinfantil, 2012).

During these brigades, demographic and clinical data are collected on each new attendee; caregivers, companions and minors go through a registration process after they arrive from their places of origin, which sometimes may take more than eight hours since most of them come from rural areas (Olarte-Sierra, Suárez and Rubio, 2018). A trained physician then performs a complete physical examination focused on CHD signs and symptoms for accurate diagnosis. Children showing an abnormal physical examination are then evaluated with the latest generation of portable electrocardiograms and echocardiograms to determine prognoses and treatment plans (García *et al.*, 2016).

For all the new CHD cases detected, there are three possible scenarios based on a likely short-term prognosis: *Priority 1* (urgent surgery), *Priority 2* (scheduled surgery), *Priority 3* (follow-up and control in a year). Priority 1 and 2 cases are then evaluated by a social worker; if pertinent, the child and a responsible adult are transported to FCI-IC in Bogotá for further study and treatment, including interventional or surgical procedures as may be required. This transfer is done thanks to the support of an allied airline; tickets are donated for the child and their companion. Once in Bogotá, they are provided boarding in the institutional shelter *New Horizons* close to FCI-IC, where they will receive all services needed during their stay.

Once care is completed, the children and their companions are returned to their place of residence, where they continue their treatment with a local healthcare provider and additional support from the local ally in each city. Each year, the Program goes back to the same city and the children are medically evaluated to assess their status.

Results of pediatric cardiology brigades

The *Give a Life Program* has granted access to pediatric cardiology consultation to 3,000 children on average per year. Out of these, 40 to 50% are patients with normal or functional murmurs, about 45% have a cardiac lesion that does not require intervention but must be followed periodically and close to 9.5% have a CHD condition requiring some type of intervention (i.e. ventricular septal defects, atrial septal defects, ductus arteriosus, Tetralogy of Fallot, single ventricles) (Rubio, MA, Dennis R, Dominguez, MT, Suarez R, Olarte-Sierra, MF, Palacio D and Ronderos, 2018).

Thanks to partnerships with local and national institutions and sponsors, around 15,000 children have been screened in the past five years ; 56.1% of them have been diagnosed and half of them have been treated,

impacting 23 departments, 14 main cities and 332 municipalities of Colombia. In 2018, FCI-IC conducted 12 brigades in the different regions of the country; 3,342 children were diagnosed, impacting 342 towns and 27 departments, and 1,932 echocardiograms and 753 electrocardiograms performed. Prioritization for medical treatment was carried out in 319 children; 190 of them were treated by FCI-IC free of charge, with an investment close to US$1,8 million.

Institutional growth through social responsibility programs

The successful experience of the *Give a Life Program* encouraged the institution to grow with other social responsibility initiatives, clinical services and scientific research. First of all, FCI-IC also created a community-based extension social program called *"Comer con Alegria"* (Eat Happy) that provides care for children at risk or with nutritional deficiencies, particularly those from a low-income background in Bogotá (Figure 4). Around 200 children and their caregivers are assessed and followed every year; around 8,000 children have been supported in the past 15 years.

As mentioned earlier, continuous diagnosis, treatment and follow-up of children with CHD has made FCI-IC a landmark at the local, national and regional levels. This has promoted the creation of the FCI-IC Congenital Heart Defects Institute, tasked with the mission to promote early detection of CHD (even during the pre-natal period), enhance innovative educational programs, promote clinical and basic research and generate networks in Latin and North America for the continued improvement of health care standards and clinical outcomes.

With respect to scientific research, there are two outstanding achievements. Firstly, in 2013 the FCI-IC Clinical Informatics Department developed an online database with demographic, clinical, echocardiographic and therapeutic variables to enhance data registration and quality. This newly developed database was also able to connect with the electronic medical records of the institution, so children with CHD detected by the brigades can now be tracked from first contact, through hospital discharge after treatment and for long-term follow-up. This has allowed for more efficient data-mining research.

Secondly, national and regional recognition of *Give a Life Program* led to governmental recognition by the National Department of Science, Technology and Innovation–Colciencias–which granted US$300,000 to the Research Department and the Congenital Heart Defects Institute to conduct a research program named PINOCCHIO (Innovation Program for Uncommon Human Congenital Heart Disease in Colombia), aimed at filling knowledge gaps in uncommon CHD cases. This program focused on research in three areas of CHD: Genetics (Cabrera *et al.*, 2018; Miranda-Fernández *et al.*, 2018), Neurodevelopment-Quality of Life and Cost-effectiveness of neonatal screening with pulse oximetry for critical CHD detection (Londoño *et al.*, 2017).

Conclusions

The *Give a Life Program* was created under the FCI-IC institutional mission to care for underserved children with CHD in Colombia, as a strategy to reduce health inequity gaps due to the lack of effective universal access to health care. However, there is a need for constant intersectoral work among public and private partner institutions, not only for successful medical care during medical brigades, but also after the children have been discharged, particularly those most affected by CHD. That is why throughout its more than 20 years of existence the Program has gathered information showing the challenges in providing follow-up once children return to their places of origin, which are usually underprivileged environments with deficient access to primary healthcare.

Steps taken by the FCI-IC to address challenges derived from the Program have also been the basis for the creation of other social responsibility programs through the replication and scaling up of *Give a Life* and have encouraged the institution to grow in high-quality clinical services and scientific research, providing not only clinical attention but also knowledge to reduce the CHD gap.

Biographies

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FIGURE 1: *GIVE A LIFE* SOCIAL PROGRAM LOGO

Source: Communications Department images Archive.
Give a Life Program, FCI-IC.

FIGURE 2: HEALTH CARE PROFESSIONALS AND VOLUNTEER TEAM PARTICIPATING IN THE SOCIAL PROGRAM

Source: Communications Department images Archive. Give a Life Program, FCI-IC

FIGURE 4: *EAT HAPPY* PROGRAM LOGO

Source: Communications Department images Archive. Give a Life Program, FCI-IC

FIGURE 3: INVITATION FLYER TO PARTICIPATE IN THE CARDIO PEDIATRIC MEDICAL BRIGADE IN MONTERIA

Source: Communications Department images Archive. Give a Life Program, FCI-IC

MoTHer Digital Solution: a Smartphone App and Web-Based Portal for Enhanced Service Delivery and Care of Women with Gestational Diabetes Mellitus

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ABSTRACT: Significantly increased numbers of women diagnosed with Gestational Diabetes Mellitus (GDM) requiring ante-natal care, pose a health service challenge. An innovative mHealth solution achieved through multi-disciplinary clinician engagement and strategic collaboration with CSIRO: Australian e-Health Research Centre, resulted in the development of a smartphone application (GDM MoTHer App) and web-based clinician portal. A pilot proof of concept study has demonstrated improved clinician care co-ordination and user satisfaction, facilitating enhanced health care for women with GDM through health care technology integration. This innovative service delivery model will be further evaluated in a multi-site implementation trial.

Introduction

Gestational diabetes mellitus (GDM) is one of the most common medical complications of pregnancy (World Health Organisation, 2013), with the prevalence of women diagnosed with GDM in Queensland, Australia, increasing from 4.9% to 8% between 2006-2013 (Queensland Clinical Guidelines, 2015). The rising prevalence of GDM, in addition to established risk factors, is related to women entering pregnancy at an older age and being overweight or obese (Moses et al., 2011). In addition, diagnostic criteria were adopted in Australia in January 2015, with earlier identification and lowered diagnostic cut offs resulting in further increased numbers of women diagnosed with GDM (Nankervis et al., 2014).

This situation is not unique to Australia; with prevalence rates increasing worldwide (Ovesen et.al., 2018) and is of significant concern to public health care systems due to associated foetal (such as macrosomia) and maternal complications. Optimising blood glucose levels during pregnancy has been shown to reduce risks of foetal and maternal complications (Tieu et al., 2010) and health care costs (Kolu et al., 2012).

In 2016, data from Metro South Health (MSH), Brisbane, Australia, indicated that GDM affected 18.5% of women (n= 907 women from 4901 deliveries) engaged in maternity services. As GDM is routinely diagnosed around the 24th-28th week of pregnancy (Nankervis et al., 2014) there is only a short window of up to 14 weeks of pregnancy to provide clinical care for optimisation of glycaemic control for women diagnosed with GDM.

Despite rising numbers of GDM, staffing and economic resources are not limitless and health care costs are known to be higher in high-risk pregnancies such as GDM (Kolu et al., 2012). Further, antenatal clinic space limitations at Redland Hospital, MSH, with space only available for Obstetricians and Midwives at weekday Antenatal clinics, posed localised challenges for access to other specialist clinicians (Diabetes Educator-often required daily for insulin initiation; Dietitian-one weekly half day clinic and Endocrinologist- two weekly half day clinics). Hence, there was the additional challenge

of multi-disciplinary team (MDT) alignment, with services running on different days and in different locations, resulting in women needing to attend multiple appointments on different days, often leading to high failure to attend rates for these ancillary services.

Usual practice at Redland Hospital, is that women diagnosed with GDM are asked to check their blood glucose level (BGL) up to four times daily with results recorded manually in a paper based diary. This can limit access to essential results for treatment of elevated BGLs as it is reliant on women remembering to bring their paper-based diary to clinic appointments. There is often also duplication of recording of BGL results by treating clinicians resulting in time inefficiency, as there is no centralised system for the reporting of BGLs.

Hence, an innovative solution was needed for this health care challenge to provide efficient, effective, safe and high-quality care to women with GDM within current staffing and service capacity.

Mobile technology solution: MoTHer GDM App and web-based clinician portal

An innovative mobile technology solution was proposed by clinicians as an option for women to record their BGLs via a smartphone App (Android or iOS) and for these results to be made available to all treating clinicians through a web-based clinician portal to enhance service co-ordination and care (Figure 1).

A preliminary survey to determine access, experience and preference for use of mobile technology indicated that patients would benefit from being offered a choice of individualised care options including mobile technology and face to face clinical care (Stoney, Hardie and Kleine, 2017). This is consistent with literature showing that both web-based and smartphone Apps are being increasingly used in the management of patients with chronic disease (Hamine et al., 2015).

A strategic collaboration was formed between the Redland Hospital Ante-natal clinical team and the Australian e-Health Research Centre, CSIRO. A Project Redesign Manager from MSH Transformation Innovation Collaborative was assigned to facilitate this collaboration.

A small funding grant was secured from the Executive Planning and Innovation Committee, MSH, in October 2017, to adapt an existing CSIRO cardiac rehabilitation Smartphone App and web-based clinician portal (Varnfield et al., 2014) to meet the needs of women with GDM and their treating clinicians.

A contract was developed and negotiated between MSH and CSIRO: Australian e-Health Research Centre to clarify roles, expectations and responsibilities in relation to: App development; technical support; education and training; privacy and information storage; intellectual property and financial arrangements.

Treating clinicians from the Ante-natal clinical team met regularly with the Project Redesign Manager and Australian e-Health Senior Research Scientist and CSIRO technical staff to develop the main App features and health measures (Figure 2) and clinician web-based portal features (Figure 3) within the constraints of resource funding allocation.

Key Smartphone App features included:

- Blood glucose monitoring (via Bluetooth from blood glucose meter with option for manual entry) - graphed and trended
- Body weight - graphed and trended
- Clinical symptoms and measures - e.g. stress, blood pressure
- Dietary indicators record - serves fruit, serves vegetables etc.
- Exercise indicators - steps per day etc.
- Key educational information and tools - e.g. multi-media educational resources

Evaluation of MoTHer GDM App and web-based clinician portal

A total of 40 women who met inclusion criteria (between 24-28 weeks gestation with confirmed first-time diagnosis of GDM) were recruited between August 2017 and April 2018 from the Antenatal Service at Redland Hospital.

Thirty-four women with GDM participated and completed this pilot feasibility study of the MoTHer GDM App and web-based clinician portal (6 women did not complete the pilot study- of which 3 withdrew). Mean pre-pregnancy BMI was 24.8kg/m^2 and the mean weeks gestation at diagnosis was 27 weeks.

All treating clinicians were given access to the password protected web-based portal (Figure 4). Resources were developed to assist clinicians in using the web-based portal and for trouble shooting issues. Formal staff training was also provided via in-services with lead clinician trainers available for additional support as required.

Patient resources were designed to assist women with GDM to download and use the MoTHer GDM App. Participating women were also given a demonstration on the use of the App in a group based education session co-facilitated within one week of diagnosis by the Diabetes Educator and Dietitian as part of the 'usual care' process. Opportunities for further education were provided for women when attending face-to-face appointments. The Diabetes Educator reviewed the BGLs five days post education and contacted the clinical midwives if BGLs were elevated, so that pharmacological therapy could be commenced (metformin and/or insulin). The Diabetes Educator reviewed BGLs biweekly thereafter. Medication treatment was documented in the web-based portal notes function.

Issue logs were kept to identify opportunities for improvement with the App and web-based portal. Importantly there were no adverse events during the implementation of this digital solution.

Clinician end user feedback on the web-based clinician portal

Clinician user satisfaction surveys were completed by six of the treating clinicians (Table 1).

All clinicians who used the portal felt that the MoTHer GDM

TABLE 1: CLINICIAN USER SATISFACTION SURVEY RESPONSES OF THE MOTHER DIGITAL SOLUTION					
	Strongly agree	Agree	Neither Agree or Disagree	Disagree	Strongly disagree
I found the MoTHer Portal easy to use	4	2	0	0	0
I feel confident that I can use the MoTHer Portal to assist my patients with their gestational diabetes care.	4	2	0	0	0
I experienced technical issues whilst using the MoTHer portal which impacted on patient care?	0	3	0	2	1
I prefer the MoTHer App and Portal to the paper based diaries	4	0	2	0	0
I feel that the MoTHer Portal was MORE time consuming than the paper based diaries.	0	0	2	2	2
I believe that the MoTHer Portal allows me to provide more efficient care to my patients e.g. the patient commenced medication/received a referral quicker.	4	2	0	0	0
I believe the MoTHer Portal reduced the number of appointments my patients required	0	3	3	0	0

Source: Dr Marlien Varnfield, Senior Research Scientist, Australian e-Health Research Centre, CSIRO

App and web-based portal improved their efficiency of caring for the women. Clinicians also recommended that identified for their patients, by allowing them to commence medication or technological issues be addressed (Table 2). receive a consult referral earlier (100% strongly agreed/agreed). The majority of clinicians also strongly agreed that the MoTHer accepted. Specifically, they appreciated its ease of use, the GDM App was preferred over the paper-based diaries (66% convenience and the accessibility of the MoTHer GDM App.

TABLE 2: CLINICIAN USER SATISFACTION SURVEY OPEN ENDED RESPONSES OF THE MOTHER DIGITAL SOLUTION		
	Please list some suggestions you have for improving the MoTHer Portal.	**Please list some aspects of the MoTHer Portal you feel should stay the same**
R1	None that I can think of right now.	I like how it is and the education links are helpful.
R3	Carbohydrate counting, technical issues fixed. Android app to look like iPhone app. Notes on portal in chronological order (opposite to now)	Easy to read BGL's
R4	Include insulin and medication ordered	Nil comment

Source: Dr Marlien Varnfield, Senior Research Scientist, Australian e-Health Research Centre, CSIRO

strongly agreed, remaining clinicians neutral) for the reporting and monitoring of BGLs. In addition, all clinicians found the web-based portal easy to use (100% strongly agreed/agreed).

On further consultation, clinicians reported that having BGL results readily available in 'real time' via the web-based portal facilitated follow up care when women missed appointments, as results could be viewed and women contacted to arrange ongoing treatment and care. The web-based portal through its reporting and tracking features also enhanced the timeliness of clinical decision making by both the Obstetrician and/or Endocrinologist for the commencement and/or dose titration of metformin and/or insulin. Reported care coordination and communication amongst treating MDT clinicians improved via the web-based portal, thereby enhancing patient safety through minimisation of reliance on viewing the patient's clinical chart to ascertain treatment changes.

Clinicians suggested that the MoTHer GDM App could be improved with inclusion of additional features that allowed for carbohydrate counting and the listing of medication(s)

Key lessons learned from this innovative digital solution
At the completion of the pilot study, clinicians were asked what worked well. Reported clinician responses included:

- Partnership with external provider Australian e-Health Research Centre, CSIRO, for technological development and technical expertise and support (App and web-based portal)
- Engaged MDT with collaboration across professions and teams/departments who were committed to ensuring the project was a success
- MSH Transformation Innovation Collaborative support for Project Redesign Manager assignment which facilitated service coordination, allowing clinical staff to focus on essential clinical service delivery
- Funding support for a Project Officer to co-ordinate the development of user manuals on the App and web-based portal for patients and staff, staff training, problem solving technological issues and central contact for clinical staff

I Regular on-site meetings for planning, development, implementation and evaluation phase by all clinical specialities

Hence, from a 'clinical improvement idea' to service innovation, development, implementation and evaluation, a representative and co-ordinated approach that is adequately resourced and supported from within all levels of the Health Care Organisation is essential (Clinicians, Departments/Teams, Facility Management, Health Service Executive).

Conclusion

With increasing numbers of women diagnosed with GDM attending Redland Hospital Ante-natal Services, an innovative health care solution was required to enable clinicians to continue to provide safe, high quality and effective care within health care system constraints including rising health care costs.

Through close collaboration with the Australian e-Health Research Centre, CSIRO and Redland Hospital MDT clinicians, the MoTher GDM App was developed and specifically tailored to the needs of women with GDM, with features such as BGL monitoring and tracking, self-management (diet and exercise) and medication information. The web-based portal was tailored to the clinical service requirements of the treating MDT clinicians.

This health platform provides a comprehensive care model through health measure monitoring and real-time data accessibility via the web-based portal, enabling clinical care providers to view their patients' progress and provide individualised feedback and/or early care intervention. BGLs can be accessed in a timely manner and actioned to improve maternal glucose levels with the aim of improving maternal and neonatal outcomes.

The innovative digital solution, consisting of an interactive patient system with real time clinician review to support clinical management of women with GDM, is the first of its kind in Australia. Results from the pilot study of the MoTher GDM App and web-based portal have shown improved clinician engagement and satisfaction, enabling health care integration using technology to facilitate better health care.

A multi-site implementation trial with an expanded patient cohort is planned which will provide more rigorous evidence and practical application. The MoTher digital solution has the potential to reduce the number of visits to outpatient clinics for women with well managed BGLs, thereby saving patient time, clinician resources and hospital costs for patients. There is also potential for this virtual clinic service to benefit women who live in geographically isolated areas, who experience challenges with clinic access and increased clinic attendance costs.

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FIGURE 1: SCHEMATIC ILLUSTRATION OF MOTHER DIGITAL SOLUTION: A SMARTPHONE APP AND WEB-BASED PORTAL
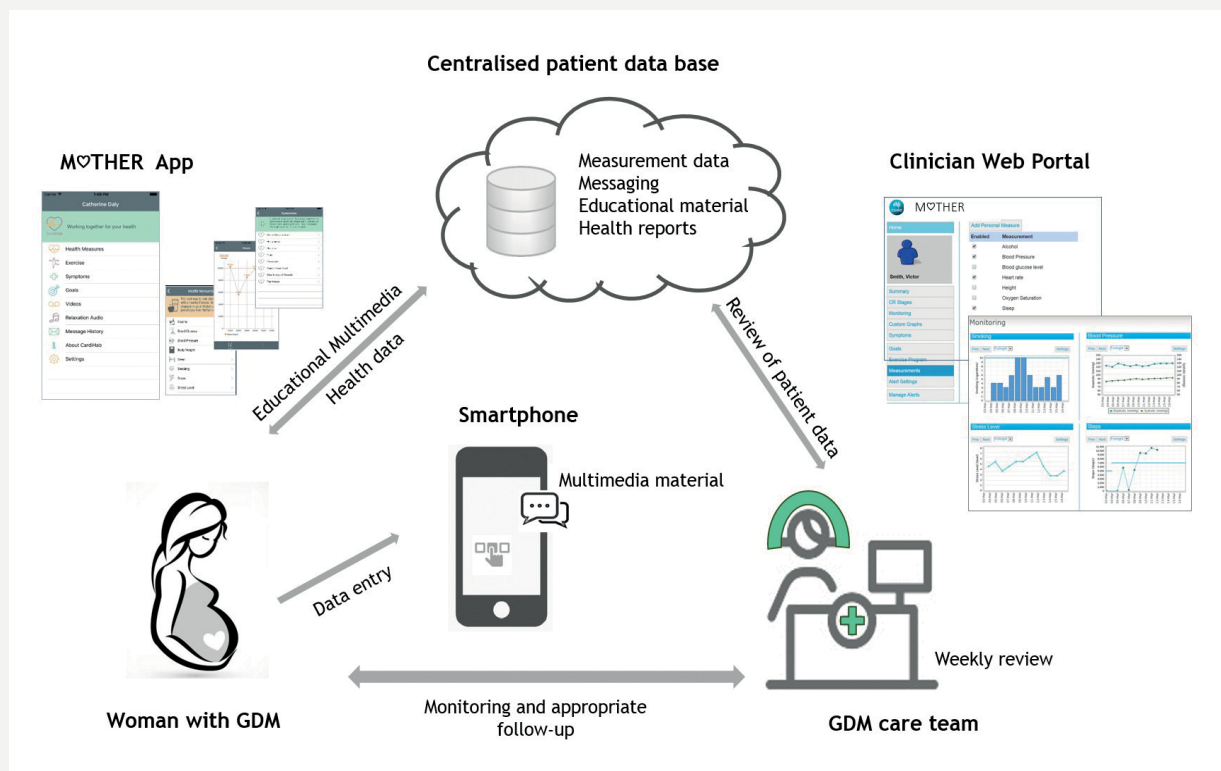
Source: Dr Marlien Varnfield, Senior Research Scientist, Australian e-Health Research Centre, CSIRO

FIGURE 2: SCREENSHOTS OF MOTHER GDM APP DISPLAYING MAIN FEATURES INCLUDING HEALTH MEASURES
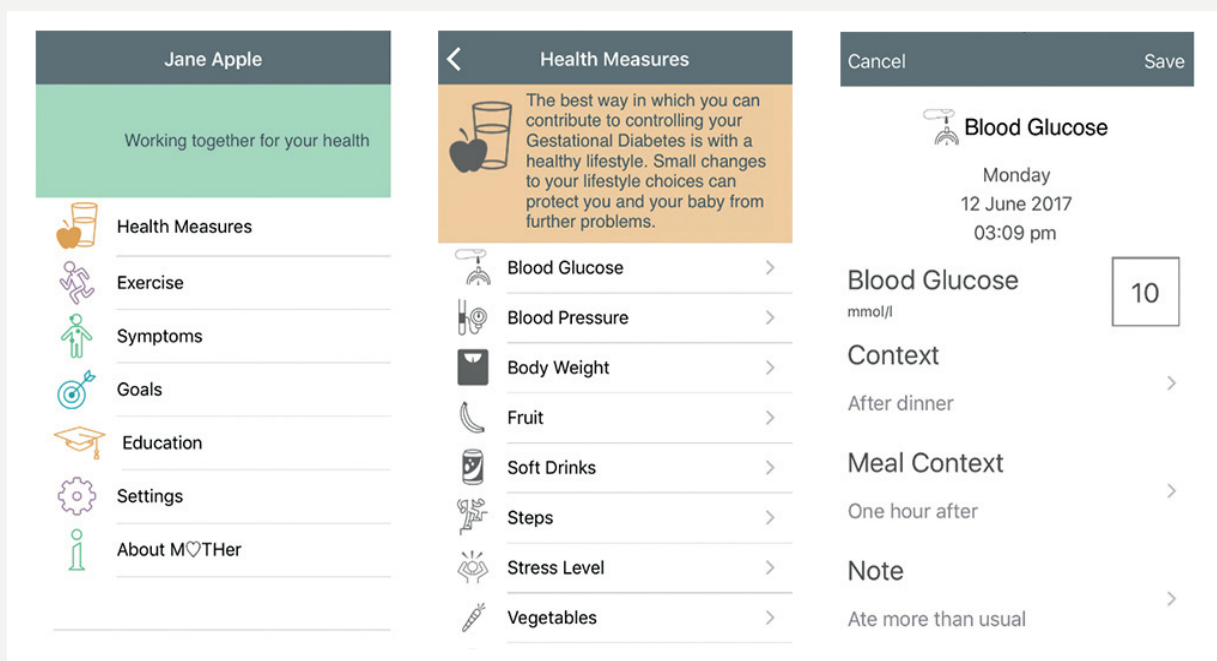
Source: Dr Marlien Varnfield, Senior Research Scientist, Australian e-Health Research Centre, CSIRO

FIGURE 3: SCREENSHOT OF THE MOTHER CLINICIAN WEB-BASED PORTAL DISPLAYING HEALTH MEASURE MONITORING

Source: Dr Marlien Varnfield, Senior Research Scientist, Australian e-Health Research Centre, CSIRO

FIGURE 4: DIABETES EDUCATOR SHOWING MOTHER GDM APP DISPLAY AND WEB-BASED PORTAL CLINICIAN VIEW

Roisine Warwick, Diabetes Educator
Source: Multi-media and communications, Metro South Health

The Implementation of Recovery-Oriented Practice at Ontario Shores Centre for Mental Health Sciences

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ABSTRACT: In 2015, the Ontario Shores Centre for Mental Health Sciences embarked on a strategic direction to embed recovery-oriented principles into its services and align with the global recovery movement. Specifically, the organization implemented Safewards, a Recovery College and the Recovery Assessment Scale to provide patients with more options, higher expectations and hope for improved mental health outcomes. In addition to enhancing recovery-related outcomes, interventions have effectively reduced stigma and improved patient safety and experience. Organizational commitment and national and international support from the mental health community has reaffirmed and evolved our commitment to further align with the recovery philosophy of care.

Introduction and Background

For many, a diagnosis of a severe mental illness (SMI) can be debilitating. In the 1960s and 1970s, the onset of an SMI was associated with a bleak and pessimistic outlook (Anthony, 1993; Deegan, 1996). During this time, mental healthcare emphasized clinical outcomes whereby remission of symptoms and amelioration of functional impairments were the focus. However, for many with SMI, full remission of symptoms is not always achievable, as there is no "cure" and this bleak prognosis can greatly erode one's sense of self and feelings of connectedness to others (Jacobson & Greenley, 2001). This institutional view of mental healthcare was associated with an unpromising quality of life and patients were often instructed to manage and even lower their expectations of prospective employment, housing, relationships and other citizenship entitlements (Anthony, 1993).

The personal recovery movement emerged from the deinstitutionalization of mental health services and challenges this traditional method of service delivery and its corresponding uncertain outcome. Recovery-oriented practice is about acknowledging and leveraging the strengths of individuals, rather than focusing on deficits. This practice supports empowerment, establishment of personal goals and engaging in a meaningful life even *despite* the persistent challenges or symptoms associated with SMI (Shepherd, Boardman and Slade, 2008).

Recovery-oriented services are associated with a shift from a custodial model of care to one that challenges stigma and power imbalances between service user and provider and raises the bar of what is considered "good enough" in terms of mental healthcare outcome. If implemented properly, recovery-oriented services yield a radical system transformation that lends itself to increased citizenship for those with SMI, which has both social and economic benefits for not only the service user, but also the community (Le Boutillier & Croucher, 2010).

Ontario Shores Centre for Mental Health Sciences (Ontario Shores) is a mental health hospital in Ontario, Canada with 346 inpatient beds and over 80,000 annual outpatient visits. In 2015, the hospital embarked on a strategic direction to further embed recovery-oriented principles into its services and align with the global recovery movement; one that is endorsed by the World Health Organization and the Mental Health Commission of Canada (MHCC, 2015) and has been adopted in many countries such as the United Kingdom, Australia, New Zealand, Demark and the United States (Shepherd, Boardman & Slade, 2008).

Although personal recovery was defined as distinct from clinical recovery in the early 1990s (Anthony, 1993), recovery-oriented practice guidelines were only introduced in Canada in 2015 (MHCC, 2015) and represent an emerging practice. Ontario Shores formally adopted this philosophy of care and attempted to implement an innovative recovery-oriented practice program that would complement clinical care and enhance service delivery and mental health outcomes.

Goals of the Recovery-Oriented Practice Program

An "Action Plan" framework was used to plan and implement

the program of recovery at Ontario Shores. The Recovery Action Plan introduced three major initiatives, each designed to challenge traditional custodial practices. These initiatives instead support the provision of recovery-oriented services, whereby providers and patients work collaboratively, sharing power and decision making. These initiatives included the following:

1. Safewards – a project designed to increase patient and staff safety by reducing potential conflict in the unit and the subsequent use of restraint and seclusion;
2. Recovery College – an education program designed to enhance the non-patient identity, while supporting self-management, engagement and empowerment;
3. Recovery Assessment Scale (RAS) – a recovery measurement tool used to improve service quality.

Implementation

Safewards

Coercive practices such as the use of restraint and seclusion (RS) can negatively impact the therapeutic alliance between patient and clinician and are associated with injury and trauma (Knowles, Hearne & Smith, 2015). Therefore, the reduction of such incidents can improve physical and psychological safety for patients and staff, in addition to quality of care. Safewards is a recovery-oriented model consisting of ten care interventions grounded in over 20 years of research reviewing strategies which have reduced conflict, violence and aggression, and subsequently the use of RS in inpatient mental health settings (Bowers, 2014). (Please see Table 1 for the Safewards Interventions and Descriptions.) For example, the Getting to Know You Wall, on which staff display biographical and interest-based information about themselves, is designed to enhance therapeutic alliance and the connection between staff and patients. This intervention is also designed to minimize the power imbalance often felt between staff and patients.

TABLE 1: SAFEWARDS INTERVENTIONS AND BRIEF DESCRIPTION

Safewards Intervention	Description
Getting to Know Each Other	Staff share innocuous information about themselves with patients, and patients do the same. This can help initiate conversations on the unit.
Calm Down Methods	Various items can relax or calm a patient, and staff should have these items easily accessible.
Bad News Mitigation	Bad news can impact a patient's behaviour. Staff should be aware and support patients before any distress can lead to a conflict incident.
Reassurance	On-unit incidents can cause a patient stress and anxiety. Staff should provide support and be actively visible after such incidents.
Soft Words	Words staff use can impact a patient. Staff need to remember to be polite, respectful, and avoid one word responses.
Mutual Help Meetings	Regular meetings on the unit where patients and staff come together to identify and share ways for supporting each other.
Talk Down	Staff should exercise control, respect, and empathy when they clarify and resolve incidents.
Discharge Messages	When being discharged, patients can write messages of hope and support for future patients to read.
Mutual Expectations	Staff and patients should decide on clear, consist behaviour expectations for the unit.
Positive Words	During handover, staff should use positive words and explain negative behaviour with psychological reasoning.

Source: Bowers, 2014

The Safewards program was systematically implemented across the hospital from 2015 to 2017.

To roll out this program, the hospital's Professional Practice department met with the various clinical units within the hospital. Within each unit, key staff members identified as Safewards Champions were enlisted to receive the Safewards education and training. A fidelity checklist was used to track the extent to which the interventions were implemented in the various units.

Once implemented, a Safewards scorecard was used to track safety outcomes, such as staff injuries, code whites and the use of coercive practices (see Figure 1 for Safewards Scorecard).

FIGURE 1: EXAMPLE OF THE SAFEWARDS SCORECARD FOR TWO UNITS

Safewards Scorecard									
Indicator	2016-17				Indicator	2016-17			
	Q1	Q2	Q3	Q4		Q1	Q2	Q3	Q4
ASU					**PRA**				
Code Whites	20	10	6	7	Code Whites	0	2	2	0
# of Unique Patients – Code White	7	5	3	5	# of Unique Patients – Code White	0	1	2	0
Staff Incident Reports	11	3	0	0	Staff Incident Reports	1	0	2	0
Staff Reported Injuries	6	3	0	0	Staff Reported Injuries	0	0	0	0
Patient Satisfaction (#37)	70%	100%	78%	--	Patient Satisfaction (#37)	67%	--	89%	71%
Patient Self-harm or Suicide	0	1	0	0	Patient Self-harm or Suicide	1	0	0	0
Seclusion					**Seclusion**				
Total Incidents	62	42	24	29	Total Incidents	1	1	1	2
Total hours	2657.6	792.3	317.7	427.7	Total hours	2.1	5.3	13.0	6.2
Hours (avg. per incident total)	42.9	18.9	13.2	14.7	Hours (avg. per incident total)	2.1	5.3	13.0	3.1
Unique visits	12	10	8	14	Unique visits	1	1	1	1
Mechanical					**Mechanical**				
Total Incidents	6	4	1	1	Total Incidents	1	0	0	0
Total hours	55.3	17.5	16.6	29.7	Total hours	1.8	0.0	0.0	0.0
Hours (avg. per incident total)	9.2	4.4	16.6	29.7	Hours (avg. per incident total)	1.8	--	--	--
Unique visits	3	3	1	1	Unique visits	1	0	0	0
Chemical					Chemical				
Total Incidents	11	15	5	3	Total Incidents	0	0	0	0
Unique Visits	7	5	3	2	Unique Visits	0	0	0	0
Clinical context:					Clinical context:				

Quarterly tracking of restraint and seclusion incidents and duration and other safety and experience indicators influenced by the Safewards program.
Source: Authors

Recovery College

A Recovery College delivers meaningful learning opportunities focused on enhancing personal recovery (Perkins et al., 2012). The college is driven by peer education and support that empower its users to choose, attend and possibly develop their own recovery-oriented education courses. Its courses are designed to promote recovery not only by providing the opportunity to learn about aspects of mental health but also by providing options for leisure and social interaction. This method of service delivery is designed to minimize the stigmatizing "mental patient" identity usually entrenched in one's diagnosis. Instead, the college is offered to "students" and participation and course selection is inclusive and not based on diagnosis.

Recovery Colleges are common in the United Kingdom, Australia and New Zealand. Ontario Shores' college complements clinical treatment and was designed to enhance connection, hope, identity, meaning and empowerment for its students (Leamy et al., 2011). At Ontario Shores, students are registered inpatients and outpatients of the hospital. To participate, prospective students meet with a peer tutor who helps them to develop an independent learning plan with up to three learning goals. These goals may consist of learning new skills such as cooking or making friends or engaging in visual arts and crafts. Based on these goals, the peer tutor may suggest some courses that would support their attainment.

Ontario Shores' Recovery College was launched in September 2016, the first of its kind in Canada (please see Arbour & Stevens, 2017 for a full review of its implementation). Ontario Shores' Recovery College began with 66 students and a roster of 21 courses during its first semester, and has grown to include over 50 courses and over 100 students in Fall 2018 (please see Table 2 for recovery college course categories).

TABLE 2: RECOVERY COLLEGE CATEGORIES AND COURSE EXAMPLE

Content Domain	Course Example
Learning and Understanding about Mental Illness	Understanding Psychosis
Skill Development	Introduction to Computers
Vocational Training	Job Readiness
Self-discovery and Identifying Strengths	Pursuing Dreams and Aspirations
Leisure, Health, and Wellness	Yoga

Source: Authors

Recovery Assessment Scale

Based on a recovery process model that focuses on hope and self-determination, the RAS is the most widely used self-report recovery outcome measure (Sklar et al., 2013). The objective was to implement a tool for use by point of care staff to support patients in two ways: 1) developing

recovery-oriented goals and 2) gauging the recovery outcome at discharge. Implementation of the RAS started in 2016 and was fully integrated into treatment by 2017.

The tool is comprised of 24 items that make up five subscales. Examples of subscales include goal and success orientation, hope and self-determination. The RAS is administered at admission and at discharge. At admission, clinicians administer the RAS and probe about particular items or subscales of the measure that might be important to the patient. The clinician can then support the patient in developing goals based on some of these items and inform the care plan.

In order to determine how much change on the RAS is meaningful and reflects actual improvement, rather than just fluctuations due to the reliability of the measure, a standard error of measurement analysis was conducted with the collected data (Eisen et al., 2007). This analysis allowed the teams to establish benchmark and meaningful change parameters. Based on this analysis, it was calculated that a four-point change on the scale at discharge is meaningful. This yields three outcome categories: 1) those whose scores increased by four or more at discharge are deemed to have meaningfully improved, 2) those whose scores decreased by four or more are said to be in decline and 3) those whose scores did not change or fluctuated by three or less in either direction at discharge are said to have experienced no change.

The data are used to improve service quality by optimizing care plans to include interventions that support aspects of recovery deemed deeply personal and important to each patient. In addition, based on the established benchmark data, the hospital identifies targets of achievement for inpatients and outpatients that categorize improvement and these results are populated on the organization's balanced score card.

Outcomes

Safewards

The goal of Safewards is to reduce the use of coercive practices. Specifically, the hospital wanted to achieve fewer than 75 incidents of RS per month and an average duration of less than 25 hours per incident, which would represent an overall decrease in duration by at least 50% from data collected since 2014. After implementing Safewards, the hospital achieved the target for incidents in nine out of eleven months of tracked data (82%). Average monthly seclusion duration was less than 25 hours in length for eleven out of eleven months of tracked data (100%). (Please see Figures 2 and 3 for monthly tracking and duration of RS incidents.)

In addition, adverse events were also tracked both before and after Safewards implementation. Serious incidents and sentinel events are typically rare in tertiary mental health care, but since the implementation of Safewards, there has been a steady decrease in moderate adverse events, suggesting an increase in patient safety. (Please see Figure 4 for patient incident tracking.)

FIGURE 2: TRACKING OF AVERAGE MONTHLY INCIDENTS USING RS PRE- AND POST-IMPLEMENTATION OF SAFEWARDS
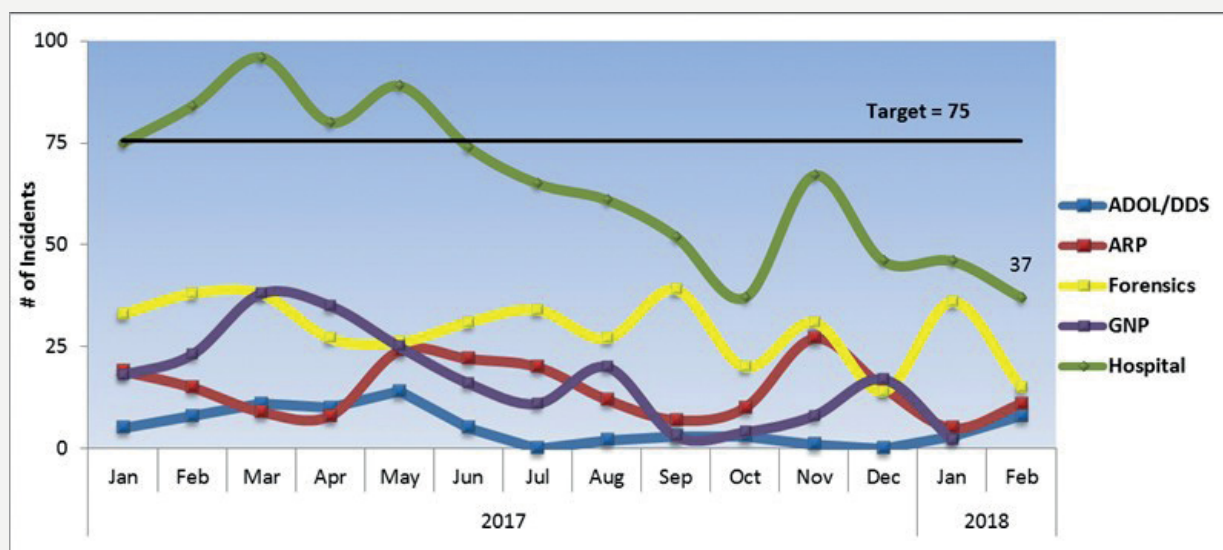
*Data is displayed for four program areas within the hospital 1) Adolescents/ Dual Diagnosis (ADOL/ DDS), 2)
Assessment and Reintegration Program (ARP) 3) Forensics and 4) Geriatric Neuropsychiatry Program (GNP).
Source: Authors*

FIGURE 3: TRACKING OF AVERAGE DURATION OF SECLUSION PER INCIDENT PRE-AND POST-IMPLEMENTATION OF SAFEWARDS
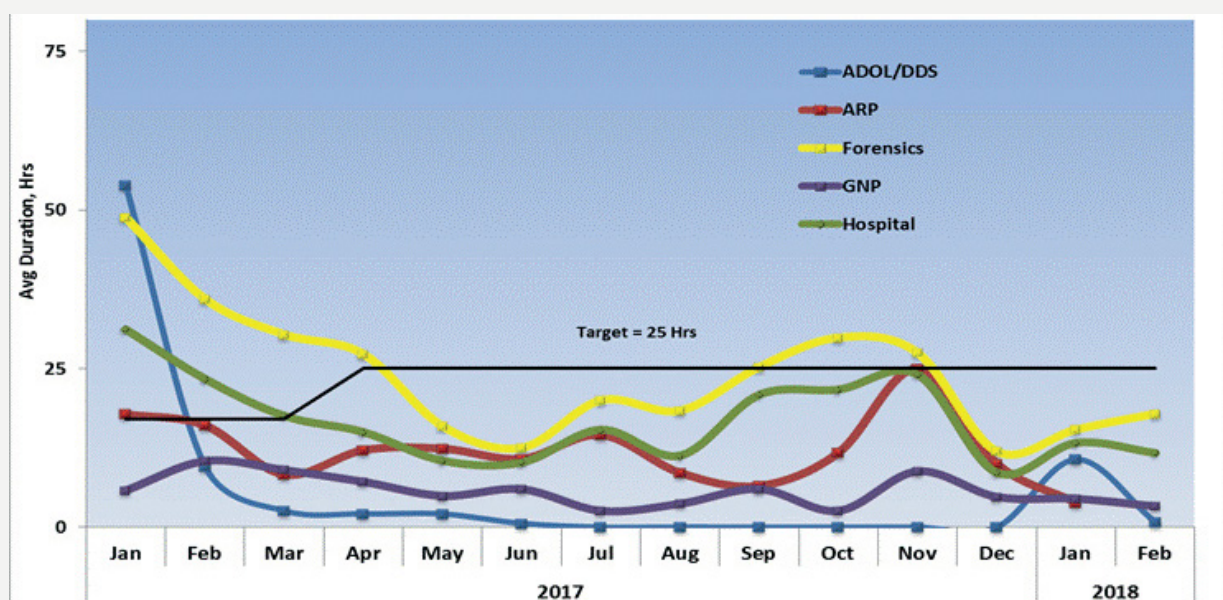
*Data is displayed for four program areas within the hospital: 1) Adolescents/ Dual Diagnosis (ADOL/ DDS), 2)
Assessment and Reintegration Program (ARP) 3) Forensics and 4) Geriatric Neuropsychiatry Program (GNP).
Source: Authors*

FIGURE 4: QUARTERLY REPORTED ADVERSE EVENTS
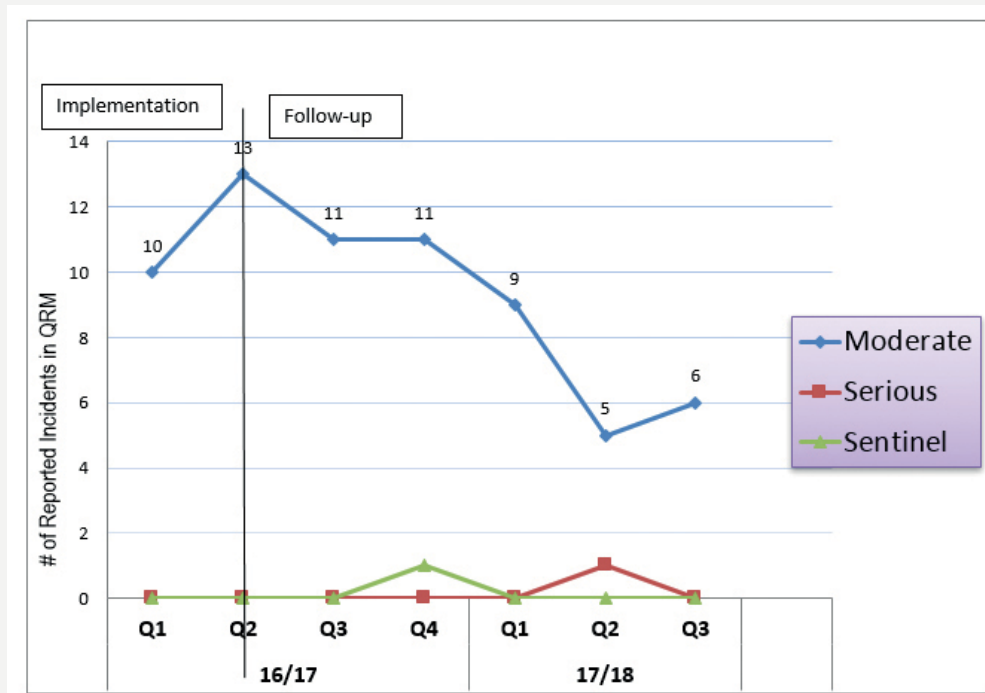
Tracking of adverse events at pre- and post-implementation of Safewards
Source: Authors

Recovery College

Qualitative data from Recovery College evaluations revealed patients reported increases in empowerment, self-esteem, connection and hope–the ultimate goal of college participation. The data consistently demonstrate an increase in patient knowledge acquisition and goal attainment. Students also consistently report high rates of recommendation. For example, 100% of the students in semesters one (60), two (99) and three (85) and 97% in semester four (120) indicated they would recommend the college courses.

Recovery Assessment Scale

Using the meaningful change parameters established from the standard error of measurement analysis (Eisen et al., 2007), the hospital set improvement targets for the RAS (i.e., 61% of inpatients and 73% of outpatients with an increase of more than 4 points on the scale from admission to discharge). For 2017-2018, meaningful inpatient change achievement was on target (61%) and outpatient programs exceeded the target (76%) (Figures 5 and 6).

FIGURE 5: QUARTERLY TRACKING OF INPATIENT OUTCOME CATEGORIES ON RAS AT DISCHARGE FOR 2017/2018
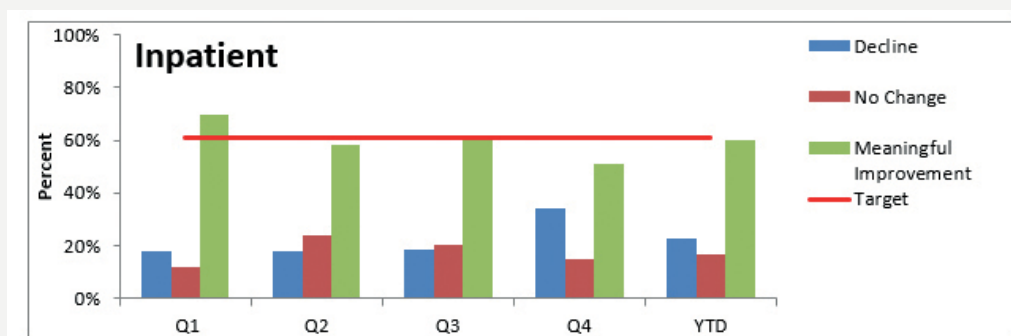
Source: Authors

FIGURE 6: QUARTERLY TRACKING OF OUTPATIENT OUTCOME CATEGORIES ON RAS AT DISCHARGE FOR 2017/2018
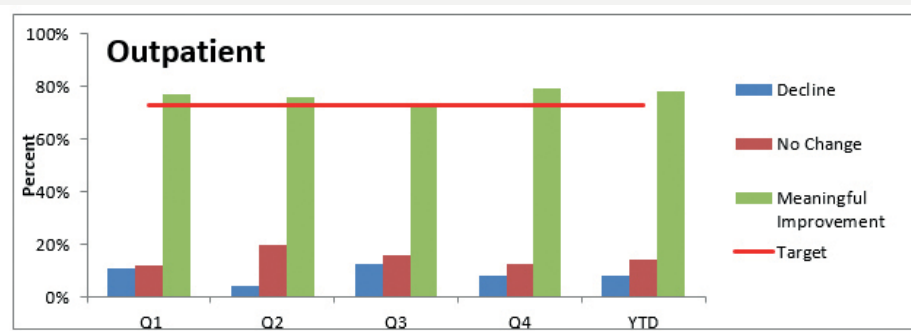
Source: Authors

Conclusions

The implementation of Recovery-Oriented Practice at Ontario Shores demonstrates a concerted effort in driving a shift in attitude with the way staff and patients share power and decision-making. Both patient and staff expertise are valued and blended in the initiatives launched at Ontario Shores.

This fundamental shift in service delivery has been recognized by national and international partners. Specifically, the Recovery College has been recognized by Accreditation Canada as a Leading Practice in healthcare and it was published as an Innovative Practice in the Canadian Journal of Community Mental Health. Team leaders from the Recovery College have been invited to join and present their work within the Recovery College International Collaborative of Practice, which includes representation from the United States, Australia, Denmark, New Zealand, Italy, France and the United Kingdom.

Ultimately, the implementation of a recovery-oriented practice program benefits patients. Specifically, the use of Safewards, the Recovery College and RAS has provided patients with more options, higher expectations and a sense of hope. These interventions are designed to reduce stigma and enhance experience and mental healthcare outcomes. Organizational commitment as well as national and international support from the mental health community has reaffirmed and evolved the vision of the Recovery Action Plan steering committee at Ontario Shores. This evolution has driven the hospital to further embed recovery-oriented initiatives into service delivery to enhance and support the recovery journey of its patients.

Biographies

Dr. Simone Arbour, PhD, is a research scientist at Ontario Shores in Whitby, Ontario. Her research is grounded in social and health psychology, with an emphasis on mental health. Dr. Arbour collaborates with clinical staff to bridge together research and practice, enhance recovery oriented practice and system transformation.

Mark Rice is a Senior Administrative Director at Ontario Shores in Whitby, Ontario. He oversees the Adolescent, Integrated Health Services, Quality and Patient Experience portfolios. He provides leadership for recovery initiatives,

including the minimization of Restraint and Seclusion practices. Mr. Rice is also a former faculty member at Durham College.

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Dynamics of Peer Learning in Medical Department: Journal and Case Sharing Club

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ABSTRACT: Shortage of experienced manpower is probably the most common challenge faced by healthcare organizations in recent healthcare trend. This problem affects not only services but also appropriate staff mixture to maintain care quality. Since 2016, 60% of the nurses in our department were having less than 3 years of experience. "Dynamic Case and Journal Sharing Club" was initially developed to assist novice nurses to bridge the gap between theoretical knowledge and real practice. Subsequently, this new learning strategy became a peer learning culture in the department and provided opportunities for staff to identify quality improvement focus through discussion. The most valuable contribution was allowed novice nurses to grow their experience through peer sharing and gradually build up their clinical insights.

Introduction

In Hong Kong, the global problem of the aging population increased the demand for public hospital services. Integration of Hong Kong and China attracted a lot of medical travel. This new phenomenon stimulated the growth and expansion of private healthcare services. At the same time, it attracted the shift of experienced nurses from the public sector to the private market. In order to meet the great demand of nursing manpower for public hospital services, a huge pool of newly graduated nurses was employed yearly to the public hospital to meet the service needs.

In 2016, 60% of the nurses in the medical and geriatric department were having less than 3 years of experience. Most of them have high academic level, the majority of them were degree holders and even some were master holders. However, their clinical exposure was limited, and their practical competency was inadequate. In order to facilitate these nurses in adapting to the clinical setting, hospital nursing service department had arranged orientation programs and skill assessment for all new graduates. Yet our department is attempting to fill their experience gaps through the peers' dynamic from the journal and case sharing club, to enhance their learning interest.

Literature Review

There were several ways of knowledge transfer. However, how to apply the nursing theory into practice and produce with a safe and effective care decision became a great question to all new graduate nurses. Lecture, as a traditional teaching strategy, has been commonly and popularly used. It suited in teaching theories and delivering information in large classes, but it is only one-way communication and lack of interactions between lecturer and audience or students (Noel, 2015).

Critical thinking is essential in the nursing profession. Nurses encounter problems with patients' needs and care every day. They need to handle problems and make appropriate decisions that are evidence-based and guided by professional standards (Popil, 2011). A passive mode of teaching is insufficient to accomplish the need for critical thinking, an active teaching and learning method should be employed. Active learning methods help to promote and encourage the development of critical thinking skills and the ability in problem solving (Popil, 2011).

Case study is a method of active learning that commonly used in clinical areas. It promotes critical thinking and clinical reasoning (Joy, 2016, Popil, 2011). Case study is a learner-centered education and motivates learners through active involvement. A case study is a description of a real situation. Cases provide data

and documents for analysis and problems for possible solutions, include brainstorm solutions (Popil, 2011). It enables learners to apply theoretical concepts to practice, demonstrate and practice decision-making skills. It will also engage with data analysis and synthesize the solutions for the case (Popil, 2011). Though case study facilitates active learning, there are also some limitations and disadvantages. As mentioned by Popil (2011), case study is "not appropriate in teaching concrete facts". It is time consuming in developing the case and there is bias from author embedded (Popil, 2011). It is some hard for learners as it required good questioning skills and may cause frustration in learners who are less prepared (Popil, 2011).

The traditional case study does not allow the instructor to assess the student's process for clinical decision making (Bowman, 2017). The unfolding case study is then developed. In unfolding case study, learners are required to question and make decisions before all information is revealed and they will notice that there may be more than one right answer for the situation (Yousey, 2013). Unfolding case study requires the learner to evaluate and reevaluate a situation by synthesizing the provided information as it follows a natural progression. Instructors can follow the students' decision-making steps. It also "requires thoughtful assessment in facilitating safe and competent nursing practice" (Yousey, 2013). Unfolding case study helps to bridge the gap between theory and practice, enables knowledge and skill application and eventually discovers the best practice (Joy, 2016).

With the advantages of using the unfolding case study, our department decided to incorporate this learning strategy into the "Dynamic Case and Journal Sharing Club". It adopted the mode of active learning which allowed interaction between learners and instructors. It also provided a platform for participants to share their experience, learn to analyze and critique problems from the research evidence. The whole process was to build up the critical thinking mindset of the novice nurses where it would be benefit for clinical decision making.

Method

A one-hour dynamic case sharing, which included 30 minutes' presentation and 30 minutes' discussion, was conducted once per month during the lunchtime in the department's conference room. A group of five advanced practices nurses, four from acute medical wards and one from intensive care unit was recruited, who acted as the facilitators to coordinate the periodic activities from the "Dynamic Case and Journal Sharing Club". The facilitator would provide suggestion and guidance to the junior nurses in preparing the presentation. Nurses from different tiers were invited as presenters to lead the sharing and present 1-2 real clinical cases that they had encountered. The presenters would facilitate the audiences to evaluate the management of the case from diagnosis to treatment and specific nursing care. As a dynamic learning approach, participants were invited to share their practice and experience during the session.

For the topics presented, a 3 "R" principle was applied. 3 "R" refers to relevance, realistic and refreshment. About relevance, the content of the case should be appropriate and relevant to the participants. For realistic, the case must be a real clinical case which they encountered before. As for refreshment, the presenter should refresh the learner concepts and information related to the topic (Figure.1).

For a program to sustain itself, the mode of delivery is important. Several approaches were used to keep the project momentum. Apart from allowing flexibility in selecting the presentation topics, the participation of the sharing club was on a voluntary basis. Besides, the five facilitators would take turns as a convener to organize the sharing session. In addition, the group size was kept to 25-30 people each session in order to facilitate the discussion. The sharing session would have conducted periodically according to the pre-set timetable during lunch time with one-hour duration. It would be suspended or deferred if the clinical situation was busy or at risk.

FIGURE 1: CONCEPT OF THE DYNAMIC JOURNAL AND CASE SHARING CLUB
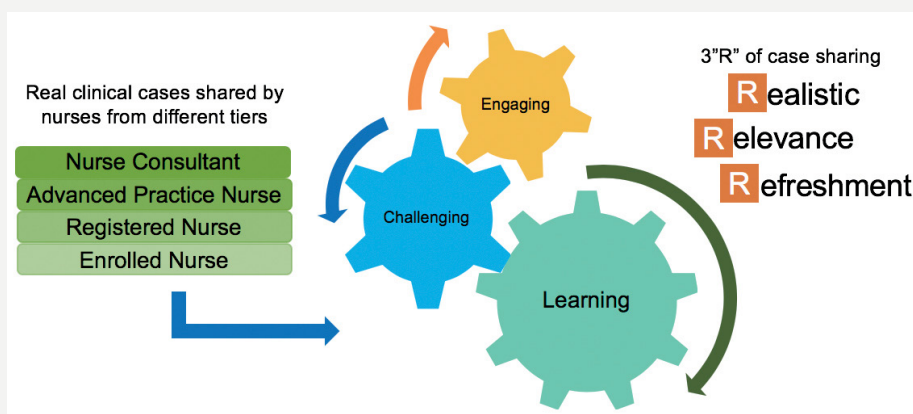
Source: authors

Data Collection

In order to estimate the effectiveness of the sharing session, members of the "Dynamic Case and Journal Sharing Club" designed an evaluation form to evaluate the appropriateness of the content and also invite comments for improvement. Both the presenter and the audience were invited to complete the evaluation form after each session.

Results

Content Evaluation

From May 2016 to December 2017, 232 attendances were recorded (75 registered nurses and 23 advanced practice nurses or above have participated in the sharing sessions). 7 sharing sessions were led by registered nurses with 3-5 years of experience and one session was conducted by a nurse consultant. The topics covered ranged from neurological care, cardiac care to safe handling of cytotoxic drugs, etc. The program evaluation revealed that (1) 98% of participants agreed that the content is practical for use in the workplace, and (2) 92% of participants agreed that facilitator(s) could enhance their clinical learning. During the discussion time, participants also identified quality improvement initiative to modify nursing practice to improve care outcome. Some practices such as handling of cytotoxic drug and patient transportation process were updated and standardized within the department.

Participants' Comment

According to comments from the evaluation from since implementation, both participants and presenters expressed the benefits from the "Dynamic Case and Journal Sharing Club". It could be classified into six aspects: (1) stimulate nurses' critical thinking, (2) promote evidence-based practice in the department, (3) transfer clinical knowledge and experience to junior nurses (4) evaluate clinical practice (5) identify risks in existing practice and (6) improve the quality of patient care have been reported in the evaluation form (Figure 2).

FIGURE 2: WHAT WAS ACHIEVED IN DYNAMIC JOURNAL AND CASE SHARING CLUB
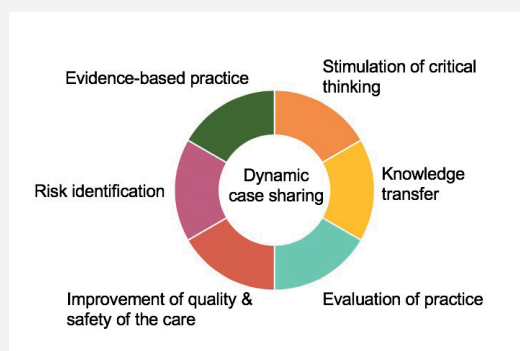
Source: authors

Discussion on the Benefit to the Department

Empowerment of staff and building a competent workforce

In our department, the shortage of experienced manpower affects not only the quality of care but also the sustain of clinical experience. The nursing management team worried about the inadequate experience nurses would jeopardize the patient safety. To alleviate the problem, the nursing management team decided to boost up the competence of the junior workforce by staff empowerment. The "Dynamic Case and Journal Sharing Club" adopted unfolding case studies. By using the new learning approach, junior nurses were encouraged to collect and bring their problems from their daily practice to present in the case sharing session. Through the process of presentation and discussion among peers, provided a dynamic and interactive learning environment for them to incorporate the skills and knowledge into practice. Literature review and critique was integrated into the sharing session. Journal and case sharing shortened junior nurses' learning period and created a peer learning culture among nurses. Junior nurses also felt that they got better support from their senior during the discussion. Although there was lack of an objective tool to measure the effect of the "Dynamic Case and Journal Sharing Club" on staff competency, an overall improvement in the efficiency of nursing care and patient satisfaction was observed in daily practice.

Improving the quality of health care services

Institute of Medicine (IOM), in its *Crossing the Quality Chasm* report, identified six dimensions of healthcare quality: safety, effective, patient-centered, timely, efficient and equitable. Since then, these six dimensions have become global aims for improvement in healthcare quality. Continue improvement in quality and safety of the health system ensures that patients are able to enjoy safe and high-quality healthcare services to achieve better health outcomes. While staff engagement and full management support are integrated part of quality improvement, the "Dynamic Case and Journal Sharing Club" provided an opportunity for it to happen.

As both senior leadership and nurses were actively involved in evaluating existing standards of practice and identifying risks related to patient care; they shared the same understanding to some of the clinical risks and problems. It was easier for the management to create a vision and a sense of urgency to change. This engagement strategy had greatly reduced staff's resistance to changes and improved the sustainability of the new projects. The team was also more willing to change and relate their knowledge and experience in improving patient care quality. Our department was successfully built up this culture and the effect had been shown in the new quality improvement initiatives. During one session of journal sharing on the importance of patient identification, staff awareness on patient identification was found weak. Five common essential procedures were identified to have a compliance problem. Thus a "Five moments on patient identification" campaign was proposed aim to increase staff awareness on the importance of checking patient identification in five essential procedures.

The effect of the campaign was shown from the serial audit reports. An increasing trend on staff compliance rate on checking patient identification was noticed. Another initiative of "Proper handling of patient's brought-in medications" to avoid omission or delay during medication administration. During the case sharing, nurses noticed that omit or delay administration of patient's brought-in medications happened regularly in the department. An idea was come out from the discussion to revise the workflow in managing patient's brought-in medications. Ultimately, the initiative improved the quality of care and a record of zero incidents related to patient's brought-in medications was achieved during June 2017 and November 2018. The new workflow was subsequently adopted by different wards in the hospital.

Conclusion

The dynamic case sharing club demonstrated an alternative solution for alleviating the problem experienced manpower shortage. It provided a learning platform for novice nurses to share their problems and identify areas of improvement from the daily clinical practice. Besides, it allowed nurses brainstorming quality improvement initiatives, disseminate new knowledge among peers, practice presentation skill and critical thinking. At the same time, it gave an opportunity for supervisors to standardize the care practice and evaluate the outcome of care quality. From our experience, the effectiveness of the new learning strategy was demonstrated. This simple measure stimulated a lot of initiatives and the initiatives measurably improved quality of care in the department.

Biographies

Main authors

Mr. Lei Pak On graduated from the Hong Kong Princess Margaret Hospital School of General Nursing in 1991 as a registered nurse and completed Intensive Care Nursing Specialty in 1996. Mr. Lei obtained Bachelor in Health Science from the University of Paisley (Scotland) in 1999 and Master in Health Management from University of Ballarat (Australia) in 2005. He is now serving as a ward manager in an Intensive Care Unit of Hospital Authority in Hong Kong.

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Mr. Sze-to Tak Leung earned his Bachelor of Nursing in The University of Hong Kong in 2008 and Master of Science in Health Services Management in The Chinese University of Hong Kong in 2016. With the specialty training of Cardiac Care Nursing, he gained experience from Cardiac Catheterization Laboratory. He currently serves as an Advanced Practice Nurse in a Medical and Geriatric Department of Hospital Authority in Hong Kong.

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Ms. Lee On Kei Angela, Department Operations Manager, Ruttonjee and Tang Shiu Kin Hospitals, Hospital Authority, Hong Kong

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Using *Data Science* to Address Two Major Problems in Daily Hospital Practice: Readmissions and Days to Discharge

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ABSTRACT: The application of Artificial intelligence (AI) techniques to exploit healthcare data has led to the development of risk prediction models that have obtained variable outcomes. With the objective of applying *Data Science* solutions to make predictions related to our daily practice that can help to improve the quality of healthcare, optimize human and material resources and reduce costs, we present a project based on a new predictive model developed using complex artificial intelligence algorithms. Their prediction ability was properly evaluated with historical data. AI requires a systematic evaluation prior to being integrated in routine healthcare. Our pilot study points to a very high accuracy in the prediction of readmissions and a good accuracy in the prediction of hospital length of stay.

Introduction

The information revolution has provided us with greater capacity to collect data and transform it into intelligence to deliver more reliable, efficient, and patient centred care (1). Nowadays, huge amounts of data are generated in the healthcare sector. Many hospitals have tools that allow them to visualize historical information on their activity in order to answer questions such as *"what happened?"* or *"why did it happen?"* However, the latest advances in Data Science allow us to go one step beyond by foreseeing future results that help us to answer questions like *"what will happen?"* or even *"what should we do?"* (Fig. 1). This is done by systems that use artificial intelligence (AI) techniques to exploit data in order to learn implicit knowledge. The application of these advances to complex healthcare data has led to the development of risk prediction models that have obtained variable outcomes (Figs. 2, 3).

A strong commitment to innovation led Hospital Plató (Barcelona, Spain) to promote a partnership with Athenea Solutions consultancy with the objective of applying *Data Science* solutions to the making of predictions related to our daily practice that can help improve the quality of healthcare, optimize human and material resources and reduce costs. The first project of our alliance was focused on two recurring problems in our hospitals: readmission risk and estimation of pending days to discharge.

Methods

The project was developed using a CRISP-DM methodology (Fig. 2) and divided into two main stages: one offline and the other online. In the offline stage, we developed a predictive model for each of the problems based on historical data; in the online stage, these predictive models were used with daily data (Fig. 3).

Offline stage

In the first stage of the project, we gathered all the available

sources of data that could be influent in some way. We focused on the following kinds of data:

- Patient data: age, sex, health insurance, social risk, etc.
- General medical data: main diagnosis, comorbidities, specific clinical conditions such as diabetes or heart failure, fragility, etc.
- Admission data: Weekday and month of admission, patient's origin, etc.
- Clinical and medical data during hospitalization: Medical speciality treating the patient, results of laboratory procedures, medication given to the patient, etc.
- Usage data before admission: number of admissions, emergencies and visits during last year, number of past readmissions, etc.

We analyzed these diverse data in-depth and made a selection based on their usefulness as well as their availability in daily practice. This is crucial because we needed to be sure that all the data considered in this project would be available and correctly codified not only as historical data but as fresh data at the time of making the daily predictions. The selected variables were processed and unified in two datasets, one for each problem. These datasets included data from patients who were discharged alive from Hospital Plató in the last 2 years. More than 50 variables from 11,502 discharges and 758 60-day readmissions were analyzed.

For the readmissions problem, the variable to predict was whether the patient would cause a readmission during the next 60 days after discharge. With this variable, we had a very imbalanced dataset, so we had to use over-sampling techniques and penalized models to overcome this difficulty. For the days to discharge problem, we discretized the variable to predict into three bins (0-2 days, 3-5 days and more than 5 days), because we were mainly interested in detecting imminent discharges and long stays. With this configuration, we did not face any imbalance problems.

Several predictive models for both problems were developed using complex artificial intelligence algorithms and their prediction ability was properly evaluated with historical data. The evaluation of the predictive models was performed using the Matthews correlation coefficient, the analysis of the ROC curve and the confusion matrix. For both problems. we obtained the best results with a model based on a voting system between a random forest and a logistic regression.

Online stage

The second stage consisted in integrating both previously created predictive models into the daily practice. First of all, an ETL (Extract, Transform, Load) solution was designed and developed. This ETL constructs datasets for both problems considering patients who are currently hospitalized or, for the readmissions problem, recently discharged. These datasets are given as input to the predictive models generated in the first stage and a probability is calculated for each of the values of the variable to predict. In the case of readmissions, we specify two thresholds that define three ranges of

readmission risk (low, medium, high). So, for example, if the predictive model gives a probability of 0.8 of readmission to a certain patient and the thresholds are 0.4 and 0.7, then the patient will be labelled as "high risk of readmission". On the other hand, for days to discharge we just use the probabilities from the predictive model. For example, if the predictive model gives a probability of 0.1, 0.2 and 0.7 for 0-2 days, 3-5 days and more than 5 days respectively, then the patient will be labelled as "more than 5 days to discharge".

Real-time predictions are made every 10 minutes and, by means of a web-based dashboard integrated in the software Minerva, they are displayed to the hospital physicians and nurses (Fig. 4). The dashboard shows some statistics and a list of all the hospitalized and recently discharged patients and, for each one of them, several general data together with their readmission risk and days to discharge. It is also possible to click on a patient's name in order to get further details.

Results

During the whole project, we kept in mind that it was essential to guarantee the acceptability of the predictions made by our healthcare professionals. Therefore, we not only focused on assuring a high predictive accuracy, but we also paid exclusive attention to the incorporation in the dashboard of descriptive information about the reasoning process, followed by our model and a gradual implantation of our Data Science solution.

The results obtained in a first pilot test showed that our model achieves a 98% of accuracy when labelling a patient with low risk and 97% with high risk of 60-day hospital readmission. This fact implies a potential reduction of the number of patients that are candidates for preventive actions to avoid a readmission, and, as a consequence, the preventive actions will be better directed to a smaller group of patients, increasing their effectiveness in reducing the readmission rate and improving the quality of care. Regarding the prediction of pending days to discharge, our model obtains an accuracy of 83% for imminent discharges (0-2 days) and 85% for predictions of long stays (more than 5 days). Being able to succeed in these two categories allows us to safely make important decisions such as temporally closing certain hospital beds, for example during the weekend.

Conclusion

The application of AI to complex healthcare data has led to the development of risk prediction models. AI requires a systematic evaluation prior to integration in routine healthcare. Our pilot study points to a very high accuracy in the prediction of readmissions and a good accuracy in the prediction of inpatient length of stay. In the next stage of this project, we will refine and extend this tool to achieve greater accuracy and involve more hospital professionals. Innovation through the use of *Data Science* to address readmissions and days to discharge, two major problems in daily hospital practice, may improve quality of care and contribute to an optimal planning of hospital resources.

Biographies

Dr. Jordi Altes, MD, is the Medical Director of Hospital Plató in Barcelona, Spain. Hospital Plató (HP) is a district Hospital with 161 beds, covering the main medical and surgical specialities. As an internist and infectious diseases expert, Dr. Altes's work is currently focused on the innovative use of information technology to improve healthcare delivery, with special attention to medical patients.

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**Marta Barahona**, Manager Director of Hospital Plató in Barcelona, Spain. Hospital Plató (HP) is a district Hospital with 600 professionals, 161 beds and 10,000 hospital discharges. Our essential objectives are: Social and Economic Sustainability and Excellence in Quality, which we develop through the EFQM model and our self-developed Corporate Social Responsibility model.

All authors reported no conflict of interest.

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FIGURE 1: FOUR TYPES OF DATA ANALYTICS
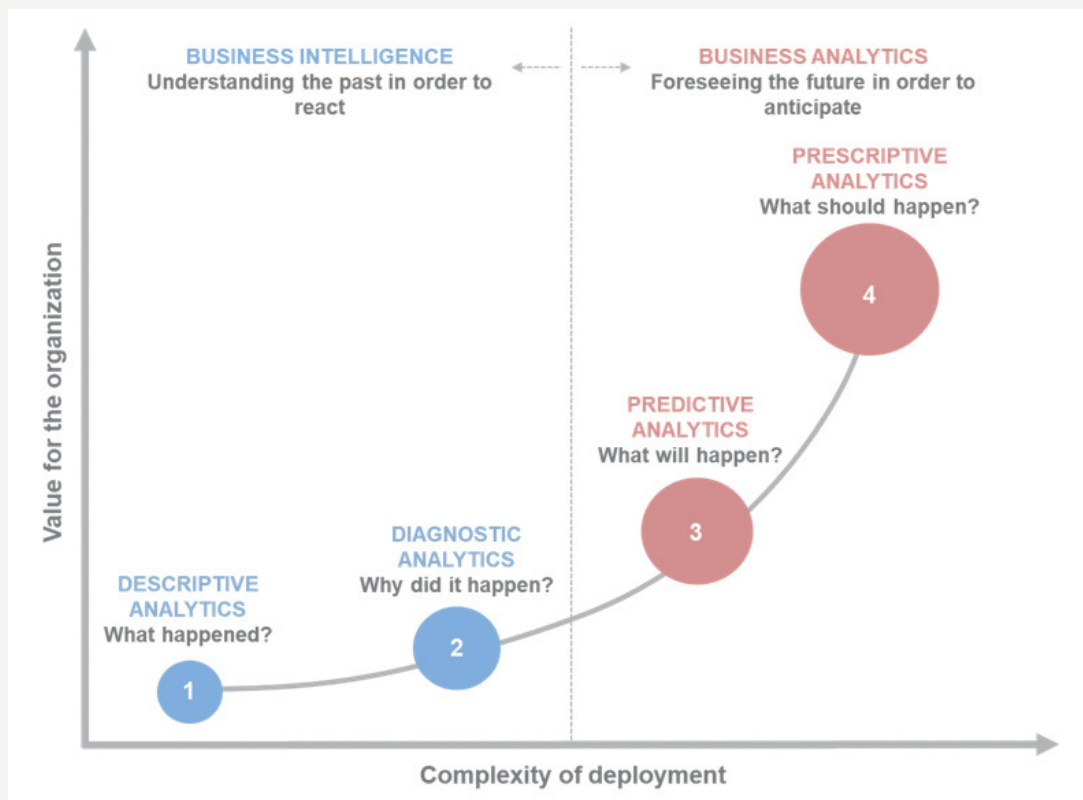
Source: authors

FIGURE 2: A METHODOLOGY FOR DATA ANALYTICS (I)
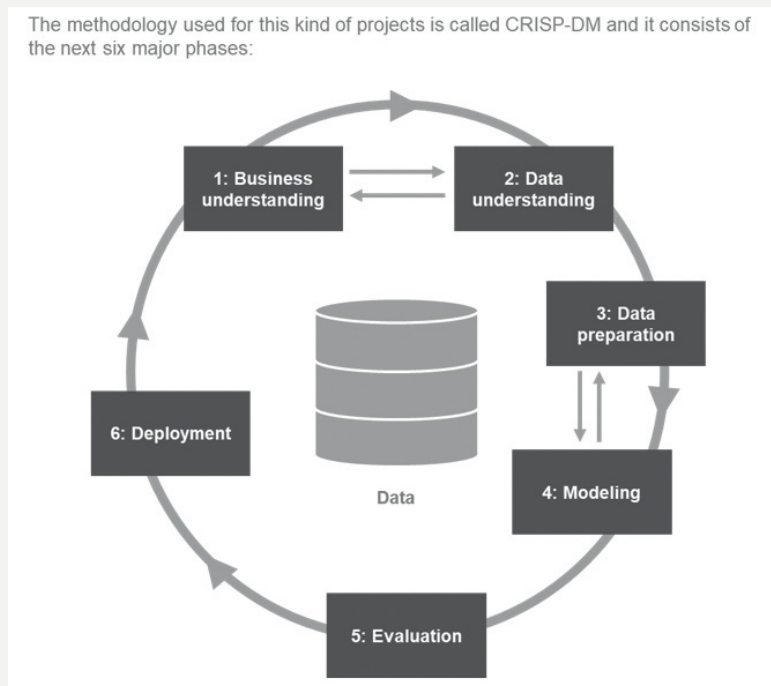
Source: authors

FIGURE 3: A METHODOLOGY FOR DATA ANALYTICS (II)
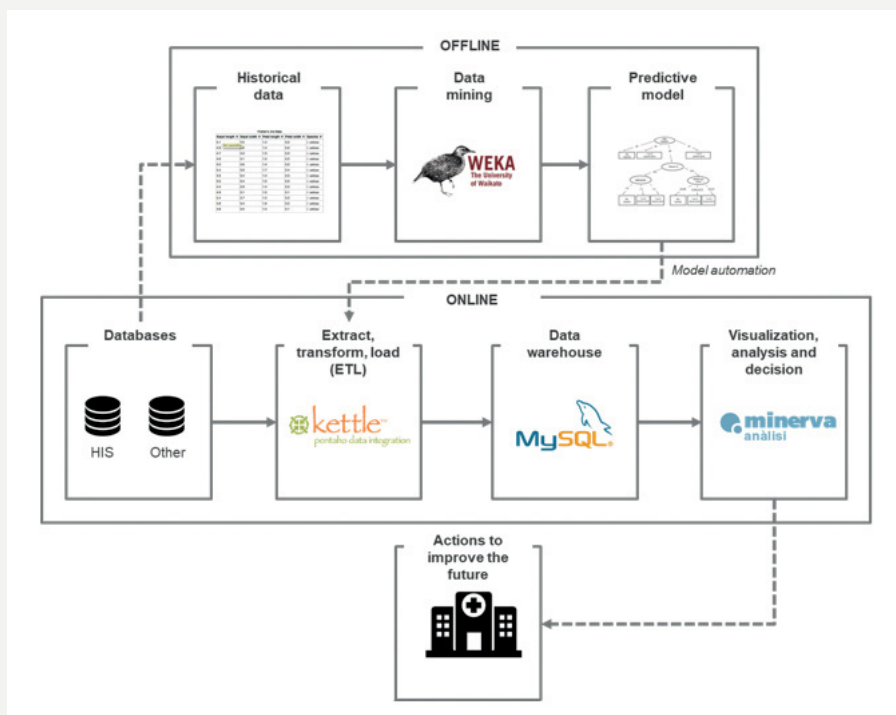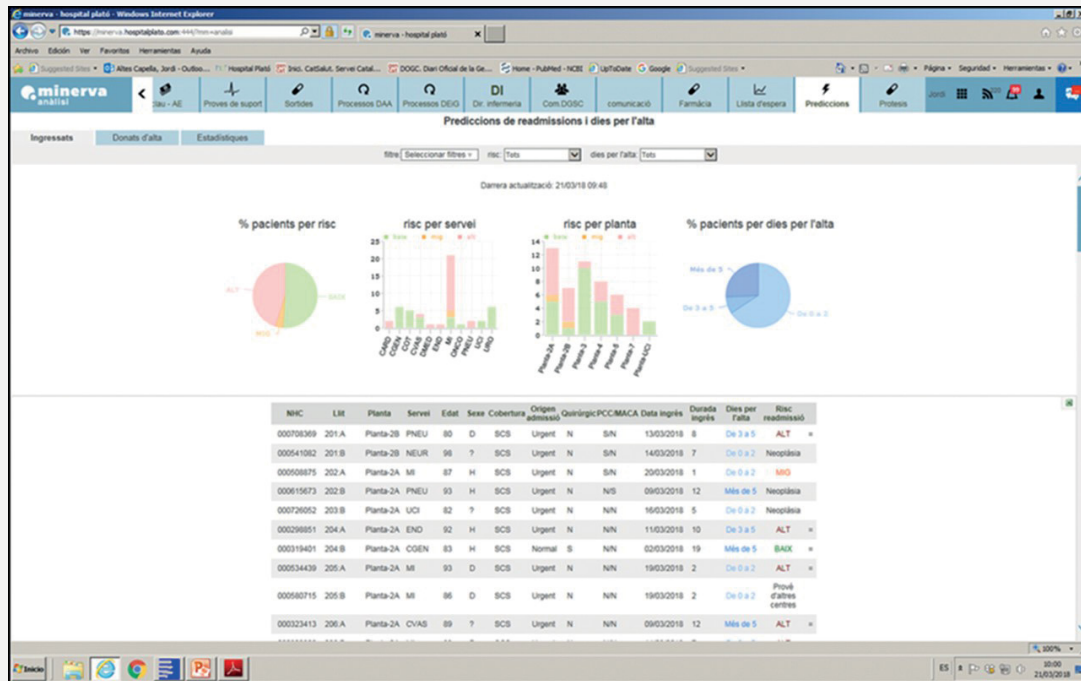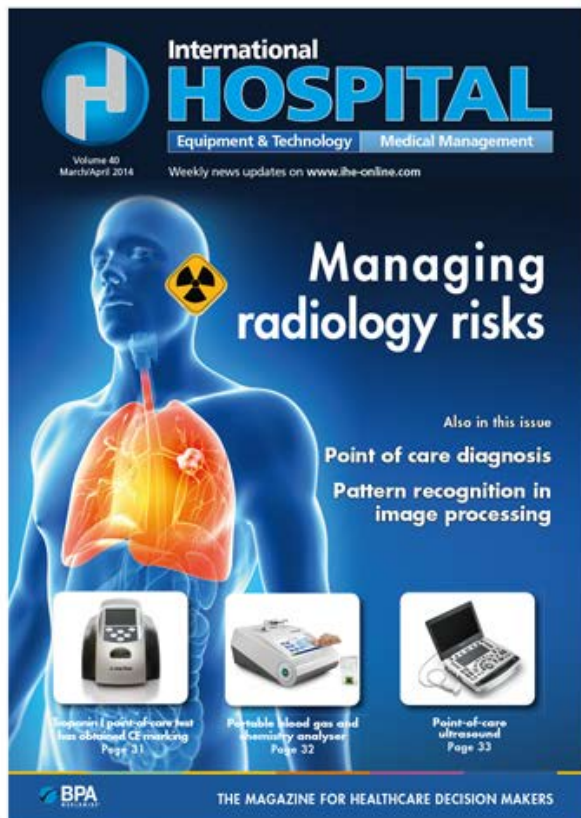

Source: authors

FIGURE 4: WEB BASED DASHBOARD OF READMISSION RISK AND ESTIMATION OF PENDING DAYS TO DISCHARGE (IN CATALAN: *RISC READMISSIÓ AND DIES PER L'ALTA*).

Source: authors

Innovation in Leadership and Management Volume 55 Number 1
Résumés en Français

Introduction de soins de santé axés sur la valeur dans le secteur de la santé bucco-dentaire
Une nouvelle approche pour améliorer la santé bucco-dentaire

Dental Health Services Victoria (DHSV) est en voie d'adopter un modèle de soins qui reflète les principes de soins de santé axés sur la valeur. En co-concevant un nouveau système en partenariat avec nos consommateurs et notre équipe nous améliorons les résultats et l'expérience des clients en matière de santé. En février 2017, nous avons commencé à élaborer un modèle de soins de santé buccodentaire axés sur la valeur et, en octobre 2018, nous avons lancé notre essai de concept au Royal Dental Hospital de Melbourne. Les commentaires des clients et du personnel ont été extrêmement positifs jusqu'à présent, ce qui indique que nous sommes en voie de créer un système de santé buccodentaire qui améliore les résultats de santé importants pour les clients.

Metro South Health Service Queensland - Notre transformation vers le premier service de santé numérique d'Australie

La transformation de Metro South en tant que premier service de santé numérique d'Australie a représenté une tâche sur grande échelle et très complexe, qui a nécessité des changements cliniques massifs tout en assurant les plus hauts niveaux de sécurité et de qualité pour les patients. Le projet a illustré l'utilisation novatrice des TIC pour obtenir des soins mieux connectés, plus efficaces, intégrés et plus sûrs. Le programme de travail sur le dossier médical électronique intégré (DME) a débuté en 2015 au Princess Alexandra Hospital (PAH) de Brisbane, le premier hôpital public tertiaire en Australie à remplacer les dossiers médicaux sur papier. Le dossier automatise le téléchargement des observations et des signes vitaux des appareils de surveillance des patients, permet de commander électroniquement et efficacement les tests de radiologie et de pathologie, et aide les cliniciens à prescrire, vérifier et administrer les médicaments à nos patients.

Système de gestion des lits de Sant Joan de Déu (BEDMA-SJD), un système innovant pour une gestion efficace des processus de santé
Excellence Award for Leadership and Management in Healthcare - Silver

Pour réduire le surpeuplement hospitalier et ses effets négatifs, nous utilisons un modèle de gestion des lits qui tient compte de l'hôpital dans son ensemble, en harmonisant les patients devant subir une chirurgie et les cas d'urgence.

Nous utilisons un algorithme qui prédit les lits disponibles quotidiennement, 24 heures à l'avance, à l'aide de données en temps réel des DSE et d'une estimation des sorties et des admissions des patients hospitalisés en urgence fondée sur des données historiques récentes. Lorsque la formule prédit une situation où aucune action n'est nécessaire, la probabilité que la réalité se passe comme prévu est bien supérieure à 90 %. Toutefois, si elle prévoit qu'un seuil sera dépassé, les mesures adoptées l'évitent dans plus de 60 % des cas. Nous gérons les patients programmés tout au long de l'année en modulant l'activité globale et la proportion de chirurgies ambulatoires.

Par conséquent, nous pouvons planifier l'utilisation des lits pour chaque groupe d'une manière interconnectée et ainsi réduire considérablement le nombre de jours de surpeuplement.

Une culture et une technologie novatrices pour faire progresser l'excellence en soins de santé mentale
Excellence Award for Leadership and Management in Healthcare - Bronze

Cet article décrit la mise en œuvre des dossiers de santé électroniques (DSE) dans un établissement de soins de santé mentale spécialisés. Avec l'appui du conseil d'administration et de l'équipe de la haute direction, ce projet a atteint ses objectifs : 1) promouvoir les pratiques exemplaires, 2) améliorer la sécurité et la qualité des soins, 3) normaliser les soins, 4) améliorer l'expérience du patient et 5) réaliser des économies. Les modules ont été adaptés aux besoins particuliers de la population en santé mentale. Notre travail se poursuit afin d'assurer la durabilité, d'établir des partenariats avec les organisations pour un système de DSE partagé et de créer une plus grande efficacité grâce à des projets novateurs utilisant l'analyse des données.

DONNEZ UNE VIE : Un programme de responsabilité sociale d'entreprise visant à améliorer les soins de santé pédiatriques cardiovasculaires chez les populations mal desservies en Colombie.
Excellence Award for Corporate Social Responsibility – Gold

Les cardiopathies congénitales comptent parmi les types de maladies congénitales les plus courants dans le monde et constituent la troisième cause de mortalité néonatale en Amérique latine. Depuis plus de 20 ans, et conformément à sa mission de prise en charge des enfants malnutris atteints de maladies coronariennes, la Fundación Cardioinfantil-Instituto de Cardiología (FCI-IC) a développé un programme de responsabilité sociale appelé « Regale Una Vida » (Donnez une vie) pour le dépistage et le traitement postnatal de ces maladies. Actuellement, ce programme dirige au moins 12 groupes médicaux à but non lucratif chaque année, dépistant environ 3 000 enfants. Dans cet article, nous décrivons les résultats et les défis du programme.

Solution numérique MoTHer : une application pour smartphone et un portail Web pour améliorer la prestation de services et les soins aux femmes atteintes de diabète sucré gestationnel

L'augmentation significative du nombre de femmes ayant reçu un diagnostic de diabète sucré gestationnel (DSG) nécessitant des soins prénatals est un défi pour les services de santé. Une solution innovatrice en cybersanté réalisée grâce à l'engagement multidisciplinaire des cliniciens et à la collaboration stratégique avec le CSIRO : L'Australian e-Health Research Centre, en Australie, a donné lieu au développement d'une application pour smartphone (GDM MoTHer App) et d'un portail Web à l'intention des cliniciens. Une étude pilote de validation de principe a démontré une amélioration de la coordination des soins cliniques et de la satisfaction des utilisateurs, facilitant l'amélioration des soins de santé pour les femmes atteintes de diabète gestationnel grâce à l'intégration des technologies de soins de santé. Ce modèle novateur de prestation de services fera l'objet d'une évaluation plus poussée dans le cadre d'un essai de mise en œuvre multisite.

La mise en œuvre d'une pratique axée sur le rétablissement de l'Ontario Shores Centre for Mental Health Sciences
Excellence Award for Quality & Safety and Patient-centred Care - Bronze

En 2015, l'Ontario Shores Centre for Mental Health Sciences s'est lancé dans une orientation stratégique pour intégrer à ses services des principes axés sur le rétablissement et s'aligner sur le mouvement mondial du rétablissement. Plus précisément, l'organisation a mis en œuvre Safewards, un collège de rétablissement et l'échelle d'évaluation du rétablissement pour offrir aux patients plus d'options, des attentes plus élevées et l'espoir de meilleurs résultats en santé mentale. En plus d'améliorer les résultats liés au rétablissement, les interventions ont efficacement réduit la stigmatisation et amélioré la sécurité et l'expérience des patients. L'engagement organisationnel et le soutien national et international de la communauté de la santé mentale ont réaffirmé et fait évoluer notre engagement à nous aligner davantage sur la philosophie du rétablissement des soins.

Dynamique de l'apprentissage entre pairs dans le service médical : Journal et Groupe de partage de cas

La pénurie de main-d'œuvre expérimentée est probablement le défi le plus courant auquel font face les organismes de soins de santé dans le contexte récent des soins de santé. Ce problème affecte non seulement les services, mais aussi la composition du personnel nécessaire au maintien de la qualité des soins. Depuis 2016, 60 % des infirmiers de notre service ont moins de 3 ans d'expérience. « Dynamic Case and Journal Sharing Club » a d'abord été conçu pour aider les infirmiers débutants à combler l'écart entre les connaissances théoriques et la pratique réelle. Par la suite, cette nouvelle stratégie d'apprentissage est devenue une culture d'apprentissage entre pairs au sein du service et a donné au personnel l'occasion de déterminer, par la discussion, les priorités en matière d'amélioration de la qualité. La contribution la plus précieuse a permis aux infirmiers novices d'enrichir leur expérience par le partage entre pairs et de développer graduellement leurs connaissances cliniques.

Utiliser la Science des Données pour résoudre deux problèmes majeurs dans la pratique hospitalière quotidienne : réadmissions et jours d'hospitalisation
Poster Award – Silver

L'application des techniques d'intelligence artificielle (IA) à l'exploitation des données sur les soins de santé a mené à l'élaboration de modèles de prévision des risques qui ont donné des résultats variables. Dans le but d'appliquer les solutions de Science des Données pour faire des prédictions liées à notre pratique quotidienne qui peuvent aider à améliorer la qualité des soins de santé, optimiser les ressources humaines et matérielles et réduire les coûts, nous présentons un projet basé sur un nouveau modèle prédictif développé avec des algorithmes complexes d'intelligence artificielle. Leur capacité de prédiction a été correctement évaluée à l'aide de données historiques. L'IA nécessite une évaluation systématique avant d'être intégrée aux soins de santé courants. Notre étude pilote fait état d'une très grande précision dans la prévision des réadmissions et d'une bonne précision dans la prévision de la durée du séjour à l'hôpital.

Innovation in Leadership and Management Volume 55 Number 1
Resumen en Español

Introducción de la atención sanitaria basada en valores en el sector de la salud bucodental
Un nuevo enfoque para mejorar los resultados de la salud bucodental

En el panorama sanitario global actual, se han ido desarrollando e implementando cada vez más normas sanitarias. Por ejemplo, en Argentina, Europa, Turquía, India, Corea del Sur y EE.UU., las normas ayudan a establecer procedimiento para mejorar la protección de los pacientes como consumidores de servicios sanitarios, farmacéuticos y/o de dispositivos médicos. Algunos de los objetivos de las principales normas incluyen combatir los medicamentos falsificados, mejorar las llamadas, reducir los errores de medicación, mejorar la eficiencia de la cadena de suministros y reducir los fraudes de reintegro. Mientras los objetivos específicos y la puntualidad pueden variar de un país a otro, los fabricantes están cumpliendo con las normas enviando los dispositivos médicos y farmacéuticos con códigos de barras que los hospitales pueden utilizar para mejorar su funcionamiento

Metro South Health Service Queensland - Nuestra transformación hacia el primer servicio sanitario digital de Australia

La transformación de Metro South en el primer servicio sanitario digital de Australia fue una labor a gran escala y de alta complejidad, que requirió cambios clínicos sustanciales junto con la garantía del mejor nivel de seguridad y calidad para el paciente. El proyecto ejemplificó el uso innovador de las TIC para alcanzar un cuidado más seguro, integrado, eficiente y conectado. El programa de trabajo basado en la historia clínica electrónica integrada (HCei) comenzó en 2015 en el Princess Alexandra Hospital (PAH) de Brisbane y fue el primer hospital público terciario en Australia en reemplazar las historias clínicas en formato papel. Las historias automatizan actualizaciones de observaciones y signos vitales que provienen de los dispositivos que controlan a los pacientes, permiten pedidos electrónicos eficientes de pruebas de radiología y patologías; y proporcionan ayuda a los médicos clínicos en la toma decisiones al recetar, confirmar y administrar medicamentos a nuestros pacientes.

Bed Management System of Sant Joan de Déu (BEDMA-SJD), un sistema innovador para la gestión eficiente de los procesos de servicios sanitarios
Premio a la excelencia por liderazgo y gestión en los servicios sanitarios - Plata

Para reducir el hacinamiento en los hospitales y sus efectos negativos, usamos un modelo de gestión de camas que tiene en cuenta el hospital en su totalidad, armonizando a los pacientes programados para cirugía y a aquellos del Servicio de Urgencias (SU).

Usamos un algoritmo que predice las camas disponibles todos los días, con 24 horas de anticipación, usando información en tiempo real de la HCE combinada con un estimativo de altas de pacientes hospitalizados y admisiones del SU basado en información reciente del historial. Cuando la fórmula predice una situación que no requiere acción, la probabilidad que de que la realidad se comporte como se predijo es mayor al 90 %. Sin embargo, si predice que se excederá un umbral, las medidas que se adopten lo evitarán más del 60 % de los días. Gestionamos a los pacientes programados a lo largo del año modulando la totalidad de la actividad y la proporción de cirugías de pacientes externos.

Por lo tanto, podemos planificar el uso de camas para cada grupo de un modo interconectado y así reducir la mayoría de los días con hacinamiento.

Una cultura y tecnología innovadora para garantizar la excelencia en la atención de la salud mental
Premio a la excelencia por liderazgo y gestión en los servicios sanitarios - Bronce

Este artículo describe la aplicación de historias clínicas electrónicas (HCE) en establecimientos especializados en atención de la salud mental. Con el apoyo de la junta directiva y del equipo de gerentes, este proyecto logró su objetivo de 1) garantizar las mejores prácticas, 2) mejorar la seguridad y la calidad de la atención, 3) estandarizar la atención, 4) mejorar la experiencia del paciente, y 5) lograr eficiencia. Los módulos fueron personalizados de acuerdo con las necesidades específicas de la población con problemas de salud mental. Nuestra labor continúa para garantizar sostenibilidad, asociarse con organizaciones para un sistema de HCE y lograr una mayor eficiencia a través de proyectos innovadores usando el análisis de datos.

REGALE UNA VIDA: un programa de responsabilidad social corporativo para mejorar la atención sanitaria pediátrica cardiovascular en poblaciones humildes en Colombia.
Premio a la excelencia por responsabilidad social corporativa - Oro

Los defectos cardíacos congénitos (DCC) están entre los tipos de enfermedades congénitas más comunes en el mundo y son la tercera causa de mortalidad neonatal en Latinoamérica. Durante más de 20 años y, en conformidad con su misión de tratar a los niños humildes que sufren DCC, la Fundación Cardioinfantil-Instituto de Cardiología (FCI-IC) ha desarrollado un programa de responsabilidad social llamado "Regale Una Vida" para el diagnóstico posnatal y el tratamiento de los DCC. En la actualidad, este programa conduce al menos 12 brigadas médicas sin fines de lucro cada año, analizando alrededor de 3 mil niños. En

este artículo, describimos los alcances y los retos de este programa.

MoTHer digital solution: una aplicación para smartphones y un portal basado en la web para una mejor prestación de servicios y una mejor asistencia para la mujer con diabetes mellitus gestacional.

El aumento considerable en el número de mujeres con diagnóstico de diabetes mellitus gestacional (GDM, por sus siglas en inglés) que requieren cuidado prenatal presenta un reto al servicio sanitario. Una solución innovadora de salud digital lograda a través del compromiso multidisciplinario de médicos clínicos y de la colaboración estratégica de CSIRO: Instituto de investigación en Salud Digital de Australia (Australian e-Health Research Centre), resultó en el desarrollo de una aplicación para smartphones (GDM MoTHer App), y un portal clínico basado en la web. Una prueba piloto de estudio conceptual ha demostrado una mejoría en la coordinación de la atención médica y en la satisfacción del usuario, facilitando un servicio sanitario optimizado para las mujeres con GDM a través de la integración de la tecnología a los servicios sanitarios. Este modelo innovador de prestación de servicios se continuará evaluando en una prueba que se llevará a cabo en múltiples establecimientos.

La aplicación de prácticas orientadas a la recuperación en Ontario Shores Centre for Mental Health Sciences
Premio a la excelencia por la calidad, la seguridad y la asistencia centrada en el paciente - Bronce

En 2015, el Ontario Shores Centre for Mental Health Sciences adoptó una dirección estratégica para incorporar principios orientados a la recuperación dentro de sus servicios y alinearse con el movimiento de recuperación mundial. Especialmente, la organización implementó Safewards, una Universidad de la Recuperación (Recovery College) y la Escala de Evaluación de Recuperación (Recovery Assessment Scale) para proporcionar a los pacientes más opciones, expectativas más altas y esperanza de mejores resultados en la salud mental. Además, para mejorar los resultados relacionados con la recuperación, las intervenciones han reducido de manera eficiente el estigma y han mejorado la seguridad y experiencia del paciente. El compromiso de la organización y el apoyo nacional e internacional de la comunidad de salud mental han reafirmado y desarrollado nuestro compromiso con el fin de estar más alineado con la filosofía de recuperación en la atención.

Dinámicas de aprendizaje entre pares en departamentos médicos: Journal and Case Sharing Club

La escasez de mano de obra experimentada es probablemente el reto más común al que se enfrentan las organizaciones dedicadas al cuidado de la salud en las últimas tendencias sanitarias. Este problema afecta no solo los servicios, sino también a una apropiada integración del personal para mantener la calidad de la atención. Desde 2016, el 60 % de los enfermeros en nuestro departamento tenían menos de 3 años de experiencia. El "Dynamic Case and Journal Sharing Club" se creó para ayudar a que los enfermeros novatos redujeran la brecha entre el conocimiento teórico y la práctica real. Luego, esta estrategia de aprendizaje nueva se convirtió en una cultura de aprendizaje entre pares en el departamento y ofreció oportunidades para que

el personal identificara el foco de la mejora en la calidad a través del debate. La contribución más valiosa fue permitir que los enfermeros novatos ganaran experiencia a través del intercambio entre pares y desarrollaran gradualmente su visión clínica.

Utilización de la información científica para abordar dos problemas más importantes en prácticas hospitalarias diarias: la readmisión y los días para el alta
Premio al mejor póster - Plata

La utilización de técnicas propias de la inteligencia artificial (IA) para aprovechar los datos de los servicios sanitarios ha llevado al desarrollo de modelos de predicción de riesgos que han tenido diversos resultados. Con el objetivo de utilizar soluciones de la ciencia de datos para realizar predicciones relacionadas con nuestras prácticas diarias que pueden ayudar a mejorar la calidad de los servicios sanitarios, optimizar los recursos humanos y materiales, y reducir los costes, presentamos un proyecto basado en un nuevo modelo predictivo desarrollado utilizando logaritmos complejos de la inteligencia artificial. Su capacidad para predecir se evaluó adecuadamente con datos del historial. La IA requiere una evaluación sistemática antes de ser integrada a los servicios sanitarios de rutina. Nuestro estudio piloto apunta a una precisión muy alta en la predicción de readmisiones y una buena precisión en la predicción de los días de ingreso en el hospital.

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中文摘要

将基于价值的医疗保健引入口腔保健领域
新方法助力优化口腔健康成果

维多利亚口腔卫生服务 (DHSV) 诊所正在转向可反映基于价值的医疗保健原则的护理模式。我们携手用户与员工，共同设计新系统，从而优化健康成果和用户体验。2017年2月，我们开始开发基于价值的口腔保健模式，2018年10月，我们开始在墨尔本皇家牙科医院进行概念验证。客户与员工反馈都非常正面，这进一步表明我们正在打造一款能够提升健康成果的口腔健康系统，这对客户具有重要意义。

昆士兰Metro South健康服务机构 - 转型成为澳大利亚首家数字化健康服务机构

Metro South转型成为澳大利亚首家数字化健康服务机构，这是一项规模浩大、错综复杂的工作，需要在完成大量临床改变的同时确保为患者提供最高水平的安全和品质。项目作为创新采用ICT的典范，实现了沟通更顺畅、效率更高效、更安全的一站式护理。一站式电子病历 (ieMR) 工作计划于2015年在布里斯班的亚历山大德拉公主医院 (PAH) 启动，该医院是澳大利亚首家取代纸质病历的三级公立医院。宾客可自动上传来自患者监控设备的观察结果和生命体征，从而以电子形式高效率地安排放射和检验，并为给患者开具处方、查验并施用药物的医师提供决策支持。

Sant Joan de Déu (BEDMA-SJD) 医院采用的病床管理系统是一款可高效管理医疗保健流程的创新系统
医疗保健领导力与管理力卓越奖 - 银奖

为了缓和医院人群过度拥挤的情况并减少其负面影响，我们采用了一种病床管理模式，这种模式将医院视为整体，对计划接受手术和来自急诊部的患者进行协调。

我们运用一种可以提前24小时预测每天可用病床的算法，将来自电子病历的实时数据与来自急诊部的入院患者预计出院率和再次入院率（基于近期历史数据）相结合。如果算式预示无需采取措施，则实际情况按预测发展的可能性将高达90%。但是，如果算式预示将超出阈值，则所采取的措施可以在超过60%的日子里避免超出。我们对全年范围内的计划入院患者进行管理，进而调控整体活动和门诊患者手术比例。

因此，我们能够以一种互联互通的方式对各群体的用床情况进行规划，从而显著减少过度拥挤天数。

创新型文化与技术推动心理健康护理卓越发展
医疗保健领导力与管理力卓越奖 - 铜奖

本文介绍了电子病历在一家专业心理健康护理机构的实施情况。在董事会和高级管理团队的支持下，这一项目成功达成目标：1) 推进最佳实践，2) 提高护理的安全性和质量，3) 实现护理规范化，4) 增强患者体验，以及 5) 创造效益。我们还根据心理健康患者的特殊需求对模块进行了

定制。我们继续展开工作以确保可持续性，同时与各机构携手合作，借助采用数据分析的创新项目来打造共享电子病历系统并创造更多效益。

赋活：一项企业社会责任项目在哥伦比亚改善医疗条件薄弱人群的心血管儿童保健水平。
企业社会责任卓越奖 - 金奖

先天性心脏病 (CHD) 是全球最常见的先天性疾病类型，也是拉丁美洲新生儿的第三大死因。二十多年来，Fundación Cardioinfantil-Instituto de Cardiología (FCI-IC) 医院在"治疗受 CHD 影响的医疗条件薄弱儿童"这一使命的指引下，针对新生儿 CHD 的检测和治疗开发了名为"Regale Una Vida"（赋活）的社会责任项目。目前，这一项目每年均可引导至少12个非盈利医疗团体，为大约3000位儿童进行体检。本文将对该项目的成果和挑战进行介绍。

MoTHer数字化解决方案：一款智能手机应用和基于网络的门户网站，为患有妊娠期糖尿病的女性提供更贴心的服务与护理。

确诊妊娠期糖尿病 (GDM) 并需要产前护理的女性人数大幅攀升，给健康服务带来了难题。 这款创新型电子健康解决方案的实现历经了跨领域医师的参与和与联邦科学与工业研究组织 (CSIRO) 下属澳大利亚电子健康研究的战略协作，最终开发出一款智能手机应用程序（GDM MoTHer 应用）和基于网络的医师门户网站。一项概念验证探索性研究表明医师护理协调水平和用户满意度均有所上升，这进而推动了通过集成健康护理技术提高对患有妊娠期糖尿病的女性的健康护理水平。 这一创新型服务交付模式将在多地点实施试验中接受进一步评估。

Ontario Shores心理健康科学中心实施康复导向型实践
质量安全和患者为本型护理卓越奖 - 铜奖

2015年，Ontario Shores心理健康科学中心开始将战略方向转向在服务中融入康复导向型原则并向全球康复活动看齐。具体来说，该机构采用Safewards、康复学院 (Recovery College) 模式和康复评估量表，赋予患者更多选项、更高的期望和优化心理健康成果的希望。这种干预除了能够优化康复相关成果之外，还有效地减少了社会羞耻感，提升了患者的安全性和体验。组织承诺和来自国内国际心理健康界的支持再次坚定了我们进一步向护理康复方法看齐的承诺并使其得到了发展。

医务部门同侪学习动态：期刊与案例交流俱乐部

根据最近的医疗保健趋势，熟练工种的短缺可能是医疗保健机构面临的最普遍难题。这一问题不仅影响到了服务，也有损旨在维护护理质量的适当员工构成。2016年起，我们部门有60%的护士经验不足三年。成立"动态案例与期刊交流俱乐部"，最初是为了帮助新手护士缩小理论知识和实践的差距。之后，这一新型学习策略变成了部门中

的同侪学习文化，并为员工提供了通过探讨确定质量提升
重点的机会。这一做法最有价值的贡献在于，让新手护士
能够通过同侪交流积累经验，进而逐渐形成对临床的深刻
认识。

运用数据科学解决医院日常实践中的两大难题：再次入院和待出院天数
墙报奖 - 银奖

通过运用人工智能 (AI) 技术来探索医疗保健数据，人们
成功开发出风险预测模型并取得了各种成果。我们以运用
数据科学 解决方案开展有助于提高医疗保健质量、优化人
力物力资源并降低成本的日常实践相关预测为目的，打造
了一个基于新预测模型的项目，该模型的开发采用了复杂
的人工智能算法。我们还通过历史数据对其预测能力进行
了适当评估。人工智能需要接受系统性的评估，然后才能
整合到日常医疗保健中。我们的探索性研究表明了再次入
院预测率的极高准确性和住院时间预测率的较高准确性。

Meet the IHF Award Sponsors

IHF/Dr Kwang Tae Kim Grand Award

Dr. Kwang Tae Kim is a surgeon with immense contributions to the healthcare sector both nationally and internationally. He was President of the International Hospital Federation from 2013 to 2015, President of the Asian Hospital Federation in 2008-2009 and President of the Korean Hospital Association in 2003-2004. He has been the Chairman of Daerim Saint Mary's Hospital in Seoul, his own hospital, since 1969.

As a strong advocate of excellence in clinical governance, leadership, quality and safety, Dr Kim initiated and generously donated to set up the IHF Awards Program during his presidency to promote IHF's visibility and its role as a knowledge hub. Because of this, the Grand Award, the most prestigious among all the IHF Awards, was aptly named after him.

The IHF/Dr Kwang Tae Kim Grand Award will be bestowed to health system, healthcare organisation or facility which achieves excellence in multiple areas including, among others, quality and patient safety, corporate social responsibility, innovations in service delivery at affordable costs, healthcare leadership and management practices. This Award is only open to healthcare service provider organisations which are either IHF Full or Associate Members.

IHF Excellence Awards Sponsors

Austco is the sponsor of the Excellence Award for Quality & Safety and Patient-centered Care

Austco Communication Systems is a global manufacturer of Nurse Call and Clinical Workflow solutions for hospitals and aged-care facilities.

Austco's flagship solution, Tacera, is an integrated IP-based Critical Communication System that delivers safety solutions for patients. By linking nurses and patients in real-time, Tacera enhances the quality of information available to caregivers, enabling them to provide immediate assistance and measurable improvements to patient's quality of care.

Pulse Mobile is the newest component of Austco's innovative Tacera Pulse software suite of next generation clinical business intelligence solutions. Pulse Mobile enhances staff efficiency and caregiver response times, which help improve patient/resident outcomes.

More information about Austco: www.austco.com

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Bionexo is a technology company that offers digital solutions for purchasing, sales and process management in healthcare. In the healthcare supply chain, there has never been a greater need to reduce costs and operate more efficiently. Through high performance digital solutions, Bionexo offers process automation, increasing the visibility and transparency of information for faster and more intelligent decision making.

More information about Bionexo: bionexo.com/en/

EOH is the sponsor of the Excellence Award for Leadership and Management in Healthcare

EOH provides the technology, knowledge, skills and organisational ability critical to Africa's development and growth. Following the Consulting, Technology and Outsourcing model, EOH provides high value, end-to-end solutions to its clients in all industry verticals. Listed in 1998, EOH attributes its 36% compounded annual growth to a culture of remaining prudent, and not just meeting, but exceeding, customer expectations. More information about EOH: www.eoh.co.za

IHF events calendar

2019

IHF

43rd World Hospital Congress
November 6-9, Muscat, Oman
For more information, contact
congress@ihf-fih.org

2020

IHF

44th World Hospital Congress
November 3-5, Barcelona, Spain
For more information, contact
congress@ihf-fih.org

2019

MEMBERS

AUSTRALIA
#NextCare Health Conference
Australian Healthcare and Hospitals Association - AHHA
May 30-31, 2019, Brisbane Convention and Exhibition Centre, Brisbane
https://nextcarehealthconference.com.au/

AUSTRIA
European Health Forum Gastein
October 2-4, 2019, Bad Hofgastein
https://www.ehfg.org/

BRAZIL
Global Summit Telemedicine & Digital Health
April 4-6, 2019, São Paulo
http://telemedicinesummit.com.br/en/

Hospital Summit 2019
National Association of Private Hospitals (ANAHP)
May 21-22, São Paulo
http://www.hospitalsummit.com.br/

Hospitalar 2019
May 21-24, São Paulo
https://www.hospitalar.com/en/

13th Brazilian Convention of Hospitals
Brazilian Federation of Hospitals
August 1-2, 2019, Salvador, Bahia
https://www.convencaofbh.com.br/
Event in Portuguese only

CANADA
National Health Leadership Conference
Healthcare innovation: Advancing better outcomes and economic growth - Healthcare*CAN*
June 10-11, 2019, Toronto, ON
http://www.nhlc-cnls.ca/

FRANCE
Meet2Win – Oncology Partnering Convention
May 21-22, 2019, Bordeaux
https://live.eventtia.com/fr/8379

Paris Healthcare Week 2019
French Hospital Federation
May 21-23, 2019, Paris Expo, Porte de Versailles, Paris
https://www.parishealthcareweek.com/en/
Event in French only

HONG KONG
Hospital Authority Convention 2019
The Hospital Authority, Hong Kong SAR
May 14-15, 2019, Hong Kong Convention and Exhibition Centre
http://www.ha.org.hk/haconvention/hac2019

JAPAN
69th Congress of Japan Hospital Association
Japan Hospital Association
August 1-2, 2019, Sapporo, Hokkaido
http://www.hospital.or.jp/gakkai.html
Event in Japanese only

SOUTH KOREA
10th Korea Healthcare Congress
Korean Hospital Association
April 4-5, 2019, Seoul
Simultaneously translated in Korean-English

SWITZERLAND
H+ Congress 2019
H+ The Hospitals of Switzerland
October 31, 2019, Bern
https://fr.hplus-kongress.ch/

UNITED KINGDOM
Confed19
NHS Confederation
June 19-20, 2019, Manchester
http://www.nhsconfed.org/events/2019/06/confed19

UNITED STATES
2019 AHA Annual Membership Meeting
American Hospital Association (AHA)
April 7 - 10, 2019, Washington, D.C.
https://www.aha.org/ahia/2019-annual-membership-meeting

For further details contact the: IHF Partnerships and Project, International Hospital Federation, 151 Route de Loëx, 1233 Bernex, Switzerland; E-Mail: info@ihf-fih.org or visit the IHF website: https://www.ihf-fih.org

2019 IHF MUSCAT
43rd World Hospital Congress

6-9 November 2019
Oman Convention and Exhibition Centre

PEOPLE AT THE HEART OF HEALTH SERVICES IN PEACE AND CRISIS

Join us in Muscat where leaders of hospital associations and healthcare organizations and industry professionals from around the globe will come together to share knowledge, expertise, experiences and best practices in leadership in hospital and healthcare management and delivery of services.

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