# Standing on the brink

## Toward the mass-adoption of secure m-health

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**Standing on the brink (9 minute summary)**


*See Dr. Casey break down the benefits, risks, and opportunities of m-health.*

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# Introduction

**With the unveiling of the first iPhone in 2007, Steve Jobs should have a place in medical history. Jobs stands alongside medical pioneers such as Rene Laennec, the 19th century French physician who, when faced with a labouring mother, rolled a piece of paper up to auscultate with greater clarity a distressed foetal heartbeat. In doing so, Laennec created a prototype of what would become the modern stethoscope, and like Jobs, created something simple and elegant, yet incredibly powerful.**

Mobile technology stands poised to revolutionise the way medical professionals organise, coordinate, and communicate. Mobile devices have already infiltrated the healthcare environment; albeit, mostly 'under the radar'. In Australia, over 50% of physicians report using their personal mobile devices for work purposes at least once per week (Abbott et al., 2018). Over 80% of US physicians use their personal smartphone at least once per week for work-related tasks (Buchholz et al., 2016).

App-based messaging platforms on personal smartphones are now widely preferred over hospital pager systems (Pourmand et al., 2018; Wu et al., 2011). Clearly, smartphones and messaging apps are here to stay; rapidly becoming a 'staple' in the junior doctor's medical bag alongside the humble stethoscope (Dimond et al., 2016).

The use of communication platforms, ranging from the ubiquitous SMS, to social platforms (e.g. Whatsapp), to purpose-built applications like Hospify, has risen dramatically over the past five years, in step with the broader m-health (mobile health) adoption in healthcare. But healthcare providers must tread with caution.

Given confidential patient data, including diagnostic images, case notes, and treatment information, are routinely transferred and stored on personal smartphones (Abbott et al., 2018), many healthcare providers are playing with fire, and under current privacy legislation (Australian Privacy Act, 1988), stand to get burned. In this article we discuss some of these privacy risks.

Available m-health messaging platforms differ dramatically in terms of features (e.g., read receipts and user feedback), security (e.g., encryption of sensitive data), and data sovereignty (e.g., storage location of private information). Without careful analysis and implementation, these differences may distract the user or open up vulnerabilities for patient data. We outline how features of m-health platforms and devices create amazing opportunities but also carry threats to the delivery of patient care, if managed poorly.

Despite the apparent benefits of 'mobile-armed' healthcare, consequences do occur: unwanted distractions (Cho & Lee, 2016), information accuracy comprehension (Kadimo et al., 2018), and ultimately, medical errors and patient safety (Westbrook et al., 2010). The time has come for providers to wrangle back control of the smartphone infiltration in healthcare, and capitalise on the huge opportunities that m-health brings to improve the delivery and management of patient care. We begin by charting the landscape of m-health, followed by an exploration of five separate opportunities that health providers would be wise to capitalise on.

# The m-Health Landscape

The World Health Organisation defines m-health as the use of mobile devices such as smartphones, tablets, and wirelessly connected personal computers in public and private health practice. The m-health revolution is already here. A recent survey of 307 health professionals found that 68% reported using WhatsApp (A Facebook product) in clinical practice and found it useful at improving efficiency and overall clinical effectiveness (Ganasegeran et al., 2017).

Personal mobile devices are also contributing greatly in the form of specialised medical applications, providing ready access to diagnostic/treatment reference material, and the storage of useful clinical notes and information that would be otherwise lost without access to a mobile device (Rokadiya et al., 2016).

Mobile phones and other m-health devices have already proved their worth outside the patient referral, handover, and clinical care environment. Studies have shown that SMS-based reminder services and patient communication technologies increase medication adherence and patient care outcomes. One systematic review of 62 studies found that overall, m-health technologies resulted in a 10% reduction in missed patient appointments, a 22% increase in patient treatment adherence, and an overall significant reduction in clinical symptomatology as compared to traditional reminder methods like physical cards and phone calls (Kashgary et al. 2017).

Within the clinical care environment, m-health technologies have demonstrated their value time and time again. Within an orthopaedic surgical team, use of the WhatsApp secure messaging platform resulted in significant productivity gains and time savings (Ellanti et al., 2017). On average, clinicians spent 5.8 minutes per phone call interpreting and responding, and 7.5 minutes per pager event. Using WhatsApp saved 7,664 minutes of time over a six-month period.

In the US, another study compared a hospital pager system against a mobile phone messaging platform (Przybylo et al., 2014). Doctors rated the mobile platform significantly more 1) effective, 2) efficient, 3) integrated, and 4) satisfying. Moreover, the platform enabled clinicians to communicate their diagnostic thoughts more concisely and was perceived to improve workflow during rounds and discharge.

Much has been said about the problems and pitfalls of m-health. Patients may perceive the use of personal mobile devices as unprofessional. Continued digitisation of patient-doctor interactions could reduce patient satisfaction. Confidential patient information may be lost or stolen. Medical errors may be increased. The digital divide between junior professionals and senior consultants may widen further. In all, healthcare providers should approach the m-health issue with their eyes wide open and their feet planted firmly in evidence-based practice.

Rather that contributing further to the 'doom and gloom' of the m-health debate, we present a series of 'opportunities' that healthcare providers should strive to surmount. We discuss and debate these opportunities, with scientific evidence, to provide a way forward for healthcare providers in these murky waters. M-health is already here, but largely in an unregulated and 'dark' capacity. Rather than pushing against this tide, healthcare organisations should identify ways to capitalise and explore this forward momentum.

## Opportunity 1:

## Patient Safety

Ever since the landmark 'To Err is Human' report, released in 2000 by the US Institute of Medicine, patient safety has burgeoned. And so it should – the report identified that in the US alone, 98,000 people die each year as a result of unintended medical practice errors and mistakes. In Australia, AIWH (2018) data shows that the number of adverse medical events increased from 4.8 to 5.4 per 100 patient separations between 2007 and 2016. According to the ABC (2013), approximately 18,000 Australians are killed each year due to medical errors and 50,000 suffer a permanent injury.

The causes of medical errors are complex. Incomplete, fragmented, disorganised, or otherwise inaccurate clinical communications are a primary cause of medical mistakes during patient care (McElroy et al., 2013). Traditional methods of communication, consisting of face-to-face interactions, telephone conversations, and paging systems have all been implicated in adverse medical events.

Traditional methods fall prey to a host of human biases that undermine the quality of information transferred. Authority cues, such as deference to hierarchy over expertise; group think, whereby teams endorse a particular decision regardless of its values; and various recall and information processing biases, which decrease the accuracy of information, all contribute to adverse medical events. M-health cuts through these biases.

Fragmented communications and inaccurate assumptions between clinicians underpin most adverse medical events (Ganasegeran et al., 2017). Some secure messaging platforms also have the novel feature of offering read receipts. Such features should help to decrease medical errors now and into the future, by offering objective evidence that information has reached its source. Secure messaging can also decrease errors associated with communications delays (Rokadiya et al., 2016).

**Yet, not all m-health messaging platforms are created equal. The prevalence of WhatsApp in healthcare settings is perhaps more a case of no suitable alternatives rather than a clear preference among providers or demonstrable superiority.**

WhatsApp is a personal messaging service designed for largely informal interactions between friends. It is not purpose-built for clinical communication, and lacks critical features like individual read receipts, patient-centric workflows, compliance with healthcare privacy legislation and codes of conduct, or a healthcare-specific user environment.

> **Conclusion:** M-health can improve patient safety outcomes, but only if purpose-designed platforms are adopted and combined with thorough user acceptance testing, trials, and training.

## Opportunity 2:

## Patient Satisfaction

Many healthcare providers are concerned about the introduction of technology into the clinical environment. Digitisation of records and increased use of electronic devices may impact negatively on the therapeutic relationship. In essence, doctors could spend more time looking at screens and less time looking at patients.

Surprisingly, studies evaluating the introduction of electronic health records have reported no such change, and even the opposite effect in some cases. Patients report that electronic medical records enhanced their satisfaction with clinical care by providing richer information about their diagnoses, prompting more in-depth questioning to clarify uncertainties, and increasing physicians' overall efficiency and clinical accuracy (Alkureishi et al., 2016).

Healthcare providers must consider how m-health devices and associated technologies will be implemented. What training will clinicians and professionals need? How can the devices be used to enhance the patient-professional interaction and create stronger bonds in the therapeutic relationship? Studies suggest that awareness of how patients perceive electronic devices will be critical here.

Training should include ways to augment or extend the patient interaction process, such as involving patients in what is being transferred or recorded, allowing them to ask more in-depth questions, and using m-health devices to provide additional information.

Another issue that must be surmounted is patient perception of m-health use in the hospital and clinical setting. The image of a doctor 'fiddling' with a personal mobile, particularly if junior, is likely to conjure up all sorts of stereotypes and biases.

However, this problem is easily fixed. Simply educating patients and providing greater awareness of the reasons why mobile devices are being used will help challenge such perceptions. Such discussions may even enhance patient satisfaction by creating a climate of trust and transparency (Peng et al., 2016). Healthcare providers can also provide 'official' devices to staff that have clear labelling and marketing campaigns built around them. For a low cost, hospitals could procure branded phone cases that may even facilitate a 'bring your own device' policy and improved professionalism (Stephens et al., 2017). Providing hospital devices could also mitigate information security and data breach concerns, as they can be protected using biometrics and encryption.

**Conclusion:** Although patients may initially be wary or even critical of m-health innovations, through awareness-raising campaigns, clear guidance and policies for staff, and consideration of if/how personal devices may be used, these challenges can be overcome.

## Opportunity 3:
## Team Dynamics

Healthcare is a diverse melting pot of professions, cultures (professional, national, organisational, departmental), and capabilities. Consequently, management of team dynamics is fraught with challenges that can result in communication errors and adverse medical events. Also, overall team performance can be impaired due to poor management of team dynamics (Marks & Mathieu, 2001).

In healthcare, hierarchy (both formal and informal) dictates the quality of many inter- and intra-profession communication events. Stories abound of a senior consultant overriding or ignoring a junior medical professional or nurse, resulting in missed opportunities to reflect on practice. Hierarchy may also impair team performance by discouraging junior or less experienced members of a team from speaking up.

In a study conducted by Johnston et al. (2015), the benefits of WhatsApp regarding the softening of team hierarchy were made apparent in this comment made by a consultant:

*"I feel that this system has encouraged the juniors to keep us updated, even about things they think are minor. They may not take the trouble to page us with informative updates to avoid disturbing us in theatre but are very happy to send a WhatsApp message".*

Clearly, secure messaging platforms have the potential to cut through hierarchy and 'flatten' professional interactions. Setting up team groups using secure messaging platforms could result in more democratic decision-making, improved sharing of information, and richer informal learning experiences.

Most of the studies in the team learning space have concentrated on the student-doctor relationship and how tools like WhatsApp can be used to improve learning outcomes. Raiman and colleagues (2017) tracked six WhatsApp groups (formed from medical students and their tutors) over eight weeks. Over 500 messages were sent in this time, including 22 pictures and 19 webpage links. Students reported significant advantages in being able to ask clarifying questions immediately and receive detailed follow-up material. Such technology takes learning 'out of the classroom' and 'into the operating theatre'.

A recent study showed that digitisation of the standard SBAR (situation, background, assessment, recommendation) methodology carried significant benefits (Panesar et al., 2016). Over 500 patient admissions were analysed, and the results showed that both handover quality and frequency improved. Also, the amount of nurse-led patient documentation increased significantly. Incorporation of 'tried and true' communication methods in clinical care and patient management by secure messaging platforms represent another significant opportunity.

**Conclusion:** m-Health technologies can significantly improve the dynamics of team performance, particularly regarding the timeliness of communication and learning; digitisation of well-established clinical communication tools represents an interesting new direction to make further in-roads here.

## Opportunity 4:

## Resource Management

In healthcare organisations, the capacity to provide safe and reliable healthcare is impacted by events both inside and outside their control. In Accident and Emergency departments, sudden patient influx can produce a phenomenon called 'going solid' whereby the care system quickly becomes 'tightly coupled' and overwhelmed (Cook & Rasmussen, 2005). In this state, small disturbances and perturbations can propagate throughout the hospital system, resulting in major adverse events.

When a department 'goes solid', managers and clinicians must have access to timely and accurate information about the flow and management of patient care. Secure messaging services on m-health platforms can be a vital lifeline in such situations. Pre-established coordination groups can be pre-specified and activated instantly. Group messages can be pushed out in rapid succession. Backup and assistance can be called upon instantly, and directed to locations where it is needed most.

In times of off-peak demand, or during routine tasks like patient rounds, messaging platforms on mobile devices offer managers greater oversight and coordination of resources. Junior doctors can coordinate with each other and transfer sensitive and time-critical information to registrars and consultants with ease. Managers can develop a 'live' situational awareness of where their resources are distributed across a facility, and redeploy those with the best experience to deal with emerging crises at the press of a button.

At the end of shift, a significant advantage of using secure messaging platforms is that the content and timeliness of electronic communications can be analysed. Feedback can then be provided directly to individuals to improve on-shift performance in the future. Patterns of communication, such as message length, content, and responsiveness can be analysed, perhaps automatically in the not-too-distant future, providing managers with new insights into how clinical care can be better deployed.

Digitisation of high reliability organising techniques like the 'after action review' could provide further structure and value to electronic messaging services. Virtual post-shift debriefings across multidisciplinary teams would enable more convenient learning opportunities and greater frequency of completed interactions.

**Conclusion:** Resource management is difficult in the bustling and dynamic health care environment; m-health innovations can significantly increase the speed of resource decision-making and efficiency of resource utilisation through keeping closer tabs on team members and the evolving dynamics of the work situation.

## Opportunity 5:

## Continuous Improvement

In today's environment of quality accreditation and certification, healthcare providers are under increased pressure to generate higher levels of service quality (Fatima et al., 2018). This can only be achieved through the use of technology to collect new and rich sources of continuous improvement data, and applying advanced 'big data' analysis techniques to deliver evidence-based insights (Pikkarainen et al., 2018).

Traditional methods of ensuring quality are clunky and expensive. Typically, external auditors are hired to conduct investigations and inspections. Reams of paperwork and documentation are scrutinised over large time periods. In all, continuous improvement is laggy and in some cases, superficial.

Secure messaging platforms can be designed to record a wealth of 'metadata' that can be subjected to mining and analysis. Data such as timestamps, lag or response times, quality control metrics and measures, and patient feedback can all be integrated digitally.

Advanced analysis can be performed on large swathes of data. Such 'big data' reveal trends across healthcare provision that would otherwise have remained invisible at local levels. Reactively, trends in patient care provision such as inefficiencies or repeated mistakes can be identified and rectified. Proactively, patient care 'leading indicators' like service satisfaction, efficiency of clinical rounds, and types of patient care issues being discussed can be 'mined' and inform strategic decision-making.

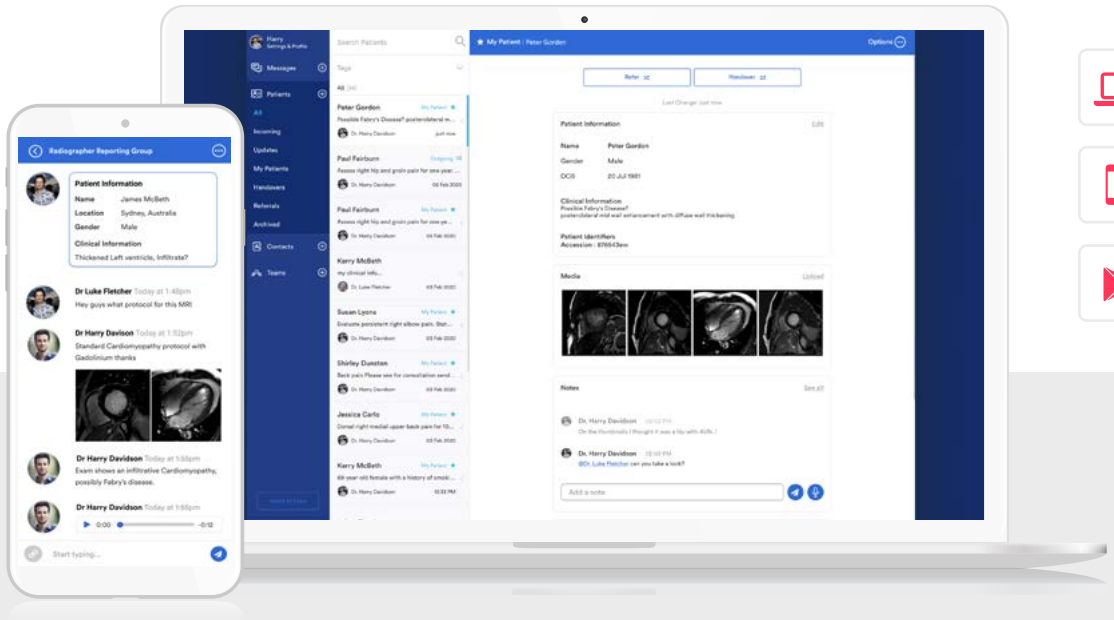
In a discussion paper outlining the future of 'smart health', Paramanik and colleagues (2017) describe a paradigm shift from reactivity to proactivity in healthcare, with m-health facilitating this transition. Many current implementations of big data in healthcare are asynchronous - in other words, reactive in the sense that data must be collected, analysed, interpreted, and then acted on. Technological breakthroughs like m-health and the Internet of Things (essentially 'wired in' medical devices) create live data that can be fed in and 'crunched' using real-time machine learning algorithms, providing clinical decision aids and prospective advice on patient care. Applied to m-health, clinician interactions, responsiveness, and patient diagnostic data captured by mobile devices can be fed into big-data enabled healthcare frameworks.

> **Conclusion**: As providers come under increasing pressure to deliver quality healthcare more cost-effectively, m-health will provide a rich source of real-time data that can be leveraged to provide new insights into organisational efficiencies, patient engagement and clinical workflows.

# In Summary

The m-health revolution has well and truly arrived. However, healthcare providers must swim ahead of the pack if the full benefits are to be realised. Importantly, unofficial use of m-health by practitioners carries significant risks to provider organisations, in the form of confidentiality, information accuracy, and patient safety. Only by engaging directly with end users and understanding their usage patterns, needs, and intentions, can effective m-health technologies and policies be developed. As it stands, many practitioners are 'making do' with existing platforms like WhatsApp.

**Given these applications are already providing significant benefits, imagine what a bespoke platform designed specifically for the healthcare setting could achieve. Such platforms already exist and stand poised, ready to usher in a new era in m-health.**



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# REFERENCES


Abbott, L. M., Magnusson, R. S., Gibbs, E., & Smith, S. D. (2018). Smartphone use in dermatology for clinical photography and consultation: current practice and the law. Australasian Journal of Dermatology, 59(2), 101-107.

ABC (2018). Medical mistakes: A silent epidemic in Australia. Retrieved from https://www.abc.net.au/worldtoday/content/2013/s3778256.htm

AIWH. (2018). Australia's health 2018. Retrieved from https://www.aihw.gov.au/reports/australias-health/australias-health-2018/contents/indicators-of-australias-health/adverse-events-treated-in-hospital

Alkureishi, M. A., Lee, W. W., Lyons, M., Press, V. G., Imam, S., Nkansah-Amankra, A., ... & Arora, V. M. (2016). Impact of electronic medical record use on the patient–doctor relationship and communication: a systematic review. Journal of General Internal Medicine, 31(5), 548-560.

Australian Privacy Act (1988). Australian Commonwealth. Retrieved from https://www.legislation.gov.au/Details/C2014C00076

Buchholz, A., Perry, B., Weiss, L. B., & Cooley, D. (2016). Smartphone use and perceptions among medical students and practicing physicians. Journal of Mobile Technology in Medicine, 5(1), 27-32.

Cho, S., & Lee, E. (2016). Distraction by smartphone use during clinical practice and opinions about smartphone restriction policies: A cross-sectional descriptive study of nursing students. Nurse Education Today, 40, 128-133.

Cook, R., & Rasmussen, J. (2005). "Going solid": a model of system dynamics and consequences for patient safety. BMJ Quality & Safety, 14(2), 130-134.

Dimond, R., Bullock, A., Lovatt, J., & Stacey, M. (2016). Mobile learning devices in the workplace:'as much a part of the junior doctors' kit as a stethoscope'?. BMC Medical Education, 16(1), 207-216.

Ellanti, P., Moriarty, A., Coughlan, F., & McCarthy, T. (2017). The use of WhatsApp smartphone messaging improves communication efficiency within an orthopaedic surgery team. Cureus, 9(2). e1040.

Ganasegeran, K., Renganathan, P., Rashid, A., & Al-Dubai, S. A. R. (2017). The m-Health revolution: Exploring perceived benefits of WhatsApp use in clinical practice. International Journal of Medical Informatics, 97, 145-151.

Giordano, V., Koch, H., Godoy-Santos, A., Belangero, W. D., Pires, R. E. S., & Labronici, P. (2017). WhatsApp messenger as an adjunctive tool for telemedicine: an overview. Interactive Journal of Medical Research, 6(2), e11.

Johnston, M. J., King, D., Arora, S., Behar, N., Athanasiou, T., Sevdalis, N., & Darzi, A. (2015). Smartphones let surgeons know WhatsApp: an analysis of communication in emergency surgical teams. The American Journal of Surgery, 209(1), 45-51.

Kadimo, K., Kebaetse, M. B., Ketshogileng, D., Seru, L. E., Sebina, K. B., Kovarik, C., & Balotlegi, K. (2018). Bring-your-own-device in medical schools and healthcare facilities: A review of the literature. International Journal of Medical Informatics, 119, 94-102.

Kashgary A, Alsolaimani R, Mosli M, Faraj S. The role of mobile devices in doctor-patient communication: A systematic review and meta-analysis. J Telemed Telecare, 2017, 23(8), 693-700

Marks, M. A., Mathieu, J. E., & Zaccaro, S. J. (2001). A temporally based framework and taxonomy of team processes. Academy of Management Review, 26(3), 356-376.

McElroy, L. M., Ladner, D. P., & Holl, J. L. (2013). The role of technology in clinician-to-clinician communication. BMJ Qual Saf, 22(12), 981-983.

Panesar, R. S., Albert, B., Messina, C., & Parker, M. (2016). The effect of an electronic SBAR communication tool on documentation of acute events in the pediatric intensive care unit. American Journal of Medical Quality, 31(1), 64-68.

Pramanik, M. I., Lau, R. Y., Demirkan, H., & Azad, M. A. K. (2017). Smart health: Big data enabled health paradigm within smart cities. Expert Systems with Applications, 87, 370-383.

Peng, W., Kanthawala, S., Yuan, S., & Hussain, S. A. (2016). A qualitative study of user perceptions of mobile health apps. BMC Public Health, 16(1), 1158-1169.

Pikkarainen, M., Pekkarinen, S., Koivumäki, T., & Huhtala, T. (2018). Data as a driver for shaping the practices of a preventive healthcare service delivery network. Journal of Innovation Management, 6(1), 55-79.

Pourmand, A., Roberson, J., Gallugi, A., Sabha, Y., & O'Connell, F. (2018). Secure smartphone application-based text messaging in emergency department, a system implementation and review of literature. The American Journal of Emergency Medicine, 36(9), 1680-1685.

Przybylo JA, Wang A, Loftus P, Evans KH, Chu I, Shieh L. Smarter hospital communication: secure smartphone text messaging improves provider satisfaction and perception of efficacy, workflow. J Hosp Med 2014 Sep;9(9):573-578

Raiman, L., Antbring, R., & Mahmood, A. (2017). WhatsApp messenger as a tool to supplement medical education for medical students on clinical attachment. BMC Medical Education, 17(1), 7-16.

Rokadiya, S., McCaul, J. A., Mitchell, D. A., & Brennan, P. A. (2016). Leading article: Use of smartphones to pass on information about patients-what are the current issues?. British Journal of Oral and Maxillofacial Surgery, 54(6), 596-599.

Stephens, K., Zhu, Y., Harrison, M., Iyer, M., Hairston, T., & Luk, J. (2017, January). Bring your own mobile device (BYOD) to the hospital: Layered boundary barriers and divergent boundary management strategies. In Proceedings of the 50th Hawaii International Conference on System Sciences, Hawaii, USA.

Westbrook, J. I., Woods, A., Rob, M. I., Dunsmuir, W. T., & Day, R. O. (2010). Association of interruptions with an increased risk and severity of medication administration errors. Archives of Internal Medicine, 170(8), 683-690.

Wu, R. C., Morra, D., Quan, S., Lai, S., Zanjani, S., Abrams, H., & Rossos, P. G. (2010). The use of smartphones for clinical communication on internal medicine wards. Journal of Hospital Medicine, 5(9), 553-559.