Chapter 3.3
Mobility in Healthcare for Remote Intensive Care Unit Clinical Management

Carolyn McGregor
University of Western Sydney, Australia

ABSTRACT

This chapter reviews current research directions in healthcare mobility and assesses its impact on the provision of remote intensive care unit (ICU) clinical management. Intensive care units boast a range of state of the art medical monitoring devices to monitor a patient's physiological parameters. They also have devices such as ventilators to offer mechanical life support. Computing and IT support within ICUs has focused on monitoring the patients and delivering corresponding alarms to care providers. However many intensive care unit admissions are via intra and inter health care facility transfer, requiring receiving care providers to have access to patient information prior to the patient's arrival. This indicates that opportunities exist for mobile gadgets, such as personal digital assistants (PDAs) to substantially increase the efficiency and effectiveness of processes surrounding healthcare in the ICUs. The challenge is to transcend the use of these mobile devices beyond the current usage for personal information management and static medical applications; also to overcome the challenges of screen size and memory limitations. Finally, the deployment of mobile-enabled solutions within the healthcare domain is hindered by privacy, cost and security considerations and a lack of standards. These are some of the significant topics discussed in this chapter.

INTRODUCTION

Intensive care units (ICUs) worldwide offer support for patients in need of critical care. The research, development, and adoption of new information technologies (ITs) and information systems (ISs) within ICUs, and particularly neonatal intensive care units (NICUs) to support patient and care provider mobility, is currently

lagging behind other industries and other areas of healthcare (McGregor, Heath, & Wei, 2005a; McGregor, Kneale, & Tracy, 2005b; Wu, Wang, & Lin, 2005). In order to understand and improve upon this lag, we need to understand the current healthcare scenario within the context of intensive care.

To start with, mobile clinical management solutions within the context of intensive care units need to consider not only the mobility of the patient, but equally importantly, the mobility of the care provider. When an incident requiring critical care occurs, patients may already be located in the care provider's ICU. However, the patient may also be located elsewhere in the care provider's hospital, in another hospital, in their home, or in another location outside the hospital of the care provider. Patients may also be in transit between any of these locations via an ambulance, helicopter, or inter-hospital transport.

Care providers can be understood in this chapter as any physician, clinician, or nursing specialist responsible for some aspect of the clinical management of the ICU patient. In daily routines, physicians, clinicians, nurses, and other staff of the hospital have to be reached and updated of new incidents and information while they are commuting in their work environments (Kafeza, Chiu, Cheung, & Kafeza, 2004). However, similar to the patients, care providers may also be located within the ICU, their office, elsewhere within their hospital, in their home, or in another location outside their hospital (e.g., attending an off-site meeting or conference).

Ammenwerth, Buchauer, Bludau, and Haux (2000) report that one of the major clinical management issues that mobile technologies can help with within the hospital is communication and reachability of care providers. This clinical management issue has the additional challenge of determining to whom the message should be sent (Kafeza et al., 2004). Both of these issues are particularly relevant within the ICU setting.

When critical care clinical management is required, the sooner the patient/care provider(s) information exchange can commence, the faster the clinical management can commence. In the case where the patient and care provider(s) are not located together within the ICU, critical care can still commence, provided there is adequate clinical management support to facilitate clinical decision making and execution.

Mobile healthcare systems (MHSs) have been defined by Wu et al. (2005) as the use of IS/IT to exchange healthcare information and services via mobile devices anytime and anywhere, providing patients and care providers with easy access to resources whether stationary or moving.

Recent research directions for computing and IT support within ICUs has focused on the delivery of alarms/alerts to care providers (Catley & Frize, 2003; Catley, Frize, Walker, & St. Germain, 2003; Shabot, LoBue, & Chen, 2000; Sukuvaara, Makivirta, Kari, & Koski, 1989; van der Kouwe & Burgess, 2003). However these approaches do not enable mobility in healthcare and neither do they exploit the substantial benefits possible by proper application of mobility. Furthermore, many intensive care unit admissions are via intra- and inter-healthcare facility transfer, requiring receiving care providers to have access to patient information, prior to the patient's arrival and often while the care provider is also in transit. These are some interesting challenges in terms of communication and reachability of care providers.

Recent surveys show that between 25-35% of physicians, as distinct from care providers in general, use personal digital assistants (PDAs) (Carroll & Christakis, 2004; Fontelo, Kim, & Locatis, 2003). However, Carroll et al. (2003) further note that these PDAs are mainly for personal information management and static medical applications. Opportunities exist for PDAs and similar handheld devices to enhance and effectively deliver services within the ICU clinical management sector. However, PDA screen size and memory are seen as crucial factors in the development of PDA applications. In addition,