Mobile Clinical Handover Application for the Intensive Care Unit

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Abstract – As resident physicians transition from providing continuous in-facility care to shift-based care, the need to communicate and accurately transfer important clinical information to their colleagues becomes significant. Current practices involve physicians sharing all important information regarding their patients at the end of the weekday, night or weekend day shift. These activities are largely performed using informal and ad-hoc methods, and employing many verbal and visual cues. In this paper we propose a mobile application which provides a simple and intuitive user interface to communicate ongoing tasks with minimizing ambiguity.

I. INTRODUCTION

The care of a critically ill infant admitted to the neonatal intensive care unit (NICU) is a complex and collaborative exercise. The infant’s care is a continuous and constant effort; it begins immediately upon admission and continues until the infant is discharged from the unit. The critical conditions existing at the time of admission require continuous twenty-four hour care lasting for several days. Therefore, a typical care plan may extend for several days, involve several specialized tasks, and produce significant information. As it is impractical for one physician to continuously supervise implementation of the entire care management plan, each day is divided into at least two shifts. Handover, refers to ‘handing over’ of the most recent relevant information that is essential for the infant’s care, and consequently, exists as an important aspect of the critical care unit. A successful handover is critical for the delivery of safe and effective patient care [1].

II. RELATED WORKS

Numerous mnemonics have been developed to try and bring standardisation to an otherwise informal activity. A mnemonic which has gained in popularity recently is called the “IPASS the Baton” [2]. With the IPASS mnemonic, key information is transferred about the patient such as: overall assessment, current status/situation and safety concerns. Based on this mnemonic, the patient’s immediate and expected condition can be comprehended without much loss of specificity. In the design of our prototype, we draw on the findings of IPASS to develop a mobile framework and prototype that is able to rapidly disseminate clinically significant workflow and relevant clinical information to support the care of clinicians in the NICU.

III. PROTOTYPE DESIGN

We designed a prototype that is able to capture clinical data from multiple sources and rapidly forward workflow data to all relevant care providers who are involved in that patient’s care plan. Moreover, the prototype is supported by a framework that tracks events along their entire duration irrespective of changing shifts and personnel. The prototype was designed after extensive study of the IPASS mnemonic and clinical observations. In our observation of clinical handover in the NICU, and reviews of ad hoc transcribed notes made by clinicians during the shift, we found that clinical tasks were largely aligned to a flexible start time, and as new tasks are generated pre-existing tasks automatically are shifted to later in the day by dynamically evaluating the priority of the task. Certain tasks are repeatedly performed, such as examining laboratory and diagnostic imaging results. The ability to leave free text notes that were accessible by all clinicians globally, was also found to an important criteria.

(A) Prototype Framework

The design contains three views representing the cognitive compartments involved during handover as identified by IPASS, and our own clinical observations. The three cognitive compartments are: (1) Active tasks: tasks which must be attended to within a certain time window, (2) What if/alternative tasks: tasks that may need to be performed if the progression of the infant differs from anticipated path and, (3) Announcement view: important information that all clinicians should be aware of pertaining to a patient and event.

In our prototype design we elected to use a central database design. This central database stores all workflow events, such as intended, planned, and monitoring events; and personal information, such as patient and staff identification numbers. Workflow events may be generated individually, or in groups, and allocated to specific staffs, or if there is an uncompleted task from the previous shift, the assuming clinician automatically receives those tasks for the current shift. We mark this
task with a different colour to denote event age. The clinician can then modify existing and/or create new tasks.

**(B) Prototype Views**

The first view (Figure 1) is the default view which loads immediately upon opening the application. In this view, all tasks are aligned temporally, and the left side of the screen provides a view of the time scale. As each task must be flexible enough to move, we used a drag and drop function. The second view (Figure 2) activated by swiping to the right, would provide a list of all patients currently under the care of a particular physician. Upon pressing on a baby’s name, the details of clinical conditions are displayed in text form. Demographic and clinical information such as gestational age, birth weight, current age, and sex are prominently displayed. When the patient has specific care plan, such as ventilation, additional detail pertaining to the mode and frequency of ventilation is also displayed. Notes are also prominently displayed in this view. A physician can at any time leave a detailed note about that particular patient for others to read. The third view (Figure 3) is akin to an announcement board and activated by swiping to the left side of the screen. Here all major information about persistent problems and alternative strategies are made visible. In particular, two sections are visible. The first section is alternative strategies for the patient’s care; these are currently termed ‘What If’ in the NICU. We elected to provide clinicians the functionality to ‘pin’ certain notes as ‘What Ifs’. The second section in this view is termed ‘Active Problems’. This is a term used to associate a patient with one or more ongoing problems that the clinical team is actively managing. Once an ‘Active Problem’ has been addressed, it no longer is displayed in this section. The contribution made by this framework and application allows for clinical workflow events to be tracked temporally across different personnel and dynamic probabilistic environments. The system supports quickly moving from the ‘Current Tasks’ trajectory to the ‘What If’ trajectory without the user having to manually track each event. This dynamic association of workflow, personnel, and clinical trajectory has not been attempted to the best of our knowledge.

**IV. CONCLUSIONS**

Mobile clinical handover application has the potential to reduce the time clinicians spend in handover, and provide a platform to help scheduling tasks and keep track of everyday work. On the negative side, privacy and security of the data is anxious critical issue. However, the system is still not fully functional, and we are will work towards a complete solution in future work.

**V. REFERENCES**
