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Remote real-time monitoring for chemotherapy side-effects in patients with blood cancers

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ABSTRACT

Background: Chemotherapy for patients with blood cancers commonly results in distressing/potentially life-threatening toxicities/side-effects. Patients receiving outpatient chemotherapy are therefore responsible for monitoring/management of complex side-effects between clinical visits. The quality and safety of care in this patient group may be improved by a remote real-time Telehealth system which reports patient data directly to the clinical treatment team.
Aim: This study evaluated the acceptability, useability and feasibility of a real-time, remote Telehealth monitoring/management system.
Methods: Patients with blood cancers receiving chemotherapy, who consented to study participation, were trained to use the Telehealth application on a smart-phone. Patients entered side-effect data for one-cycle of chemotherapy. Data exceeding pre-set thresholds triggered alerts (via Short-Message-Service) to clinic nurses for actioning. At study conclusion patients completed semi-structured interviews about the experience of using the Telehealth system which were: recorded, transcribed and; underwent content analysis.
Findings: Seventeen patients used the system and completed the interview. The system was easy-to-use and fitted with daily routines. Perceived benefits included: reassurance; empowerment; increased health-awareness/adherence to self-care; promotion of timely clinical intervention and improved recall of side-effects and communication with clinicians/family/friends. The system was more beneficial to those experiencing more numerous side-effects. Suggested changes included: language clarification and additional side-effect monitoring.
Discussion: Use of a revised system was supported as an adjunct to current practice. Future use of a similar Telehealth system would enhance current pre-chemotherapy education, patient self-care adherence, alongside improved side-effect communication.
Conclusion: Additional randomised controlled trials are required to elucidate quantitative improvements in health outcomes prior to clinical introduction.

Summary of relevance

Problem or issue

- Patients with blood cancers receiving chemotherapy are at higher risk of distressing/potentially fatal side-effects than solid tumour patients.

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- Between clinic visits patients are responsible for the monitoring/management of complex symptoms.
- Not all patients are equally equipped to make complex decisions in relation to the management of side-effects in the ambulatory setting.
- Early intervention to alleviate and/or prevent side effect escalation could decrease patient distress and improve outcomes in relation to potentially life-threatening events (eg neutropenia).

What is known

- Early studies of remote-monitoring Telehealth systems are acceptable in patients with solid tumours and have potential to improve patient outcomes/safety.

What this paper adds

- First real-time Telehealth monitoring system developed specifically for needs of patients with blood cancers.
- Patients receiving chemotherapy found the system easy-to-use and fitted with daily routine whilst promoting reassurance, empowerment, improved communication and self-care adherence.
- Future use supported as an important adjunct to current practice.

1. Introduction

Blood cancers account for around 10% of new cancer diagnoses in Australia (Australian Institute of Health and Welfare and Australasian Association of Cancer Registries, 2010). Whilst chemotherapy is a core treatment, its toxicities can lead to distressing and potentially life threatening side-effects (e.g. nausea/vomiting, mucositis, diarrhoea, febrile neutropenia, infections, fatigue), some of which are more commonly experienced in blood cancers than solid tumours (Butt et al., 2008; Coiffier et al., 2002; Du, Osborne, & Goodwin, 2002; Gerlier et al., 2010; Kuderer, Dale, Crawford, Cosler, & Lyman, 2006; Park & Trovato, 2004; Richardson & Ream, 1996; Scully, Sonis, & Diz, 2006; Vose et al., 2003). The patient experience of severe side-effects is associated with poor treatment compliance, impaired quality-of-life, increased infections, hospital bed-days-of-care and mood disturbance (Glaus, 1993; Scully et al., 2006; Sonis et al., 2001). Early detection and management of side-effects is therefore vital to improve patient outcomes (Aranda et al., 2012; Breen et al., 2009; McKenzie et al., 2011).

Cancer treatments are increasingly provided in the ambulatory setting with patients receiving chemotherapy on an outpatient basis. Patients are required to closely monitor and manage a range of diverse and complicated side-effects, without readily available clinical support, for up to 4-weeks between clinical visits. Patients are also responsible for making potentially complex decisions about how/when to contact the treatment team in the event of new, escalating or unexpected side-effects. However, not all patients are equally well-equipped to do this and patients often delay seeking help (Aranda et al., 2012; Breen et al., 2009; Howell, Smith, & Roman, 2008; McKenzie et al., 2011). When patients actively seek assistance, or present for review, side-effect assessment relies on retrospective patient recall and is prone to recall bias, impeding optimal and timely responses (Litt, Cooney, & Morse, 1998; Litwin & McGuigan, 1999). With many cancer treatments being highly distressing and immunosuppressive, timely response to side-effects is vital to optimise patient management and prevent deterioration. *Improved strategies to educate and support patients in the monitoring and management of side-effects whilst receiving outpatient chemotherapy are therefore imperative.*

2. Literature review

Telehealth devices allowing remote, real-time monitoring and clinical response to side-effects maybe a cost-effective strategy to optimise care and are increasingly used in chronic disease to improve patient outcomes (Jones et al., 2014; Wildevuur & Simonse, 2015). Telehealth systems enabling real-time monitoring are now emerging in oncology. Although the scope of oncology studies is limited (Kofoed, Breen, Gough, & Aranda, 2012), early positive findings include: high levels of patient/clinician acceptability and compliance (Gibson, Aldiss, Taylor, Maguire, & Kearney, 2009; Maguire, McCann, Miller, & Kearney, 2008; Maguire et al., 2005; McCann, Maguire, Miller, & Kearney, 2009); enhanced communication (Maguire et al., 2005); increased patient reassurance and support (Head, Keeney, Studts, Khayat, & Bumpous, 2011; Maguire et al., 2008); increased patient understanding of treatment (Maguire et al., 2005; Maguire et al., 2008); improved quality-of-life and symptom management; (Chumbler et al., 2007b; Cleeland et al., 2011; Kearney et al., 2009; Kroenke et al., 2010); promotion of timely clinical intervention (2008; Maguire et al., 2005) and reduced usage of health services (Chumbler et al., 2007a).

One shortcoming of oncology Telehealth systems to date is the lack of focus on high-risk patient groups (ie those at increased risk of adverse events such as patients with blood cancers receiving high-toxicity chemotherapy) (Kofoed et al., 2012). The potential for these systems to be used as part of patient education and support has been under-utilised. We have developed a prototype remote chemotherapy side-effect monitoring/management system for patients with blood cancers (The Advanced Symptom Management System–Haematology; ASyMS-H) which also contains educational information and evidence-based self-care strategies (Breen et al., 2012). The aim of this study was to evaluate the acceptability, usability and feasibility of the ASyMS-H remote side-effect monitoring and management system, alongside perceived benefits/limitations.

3. Methods

3.1. Participants and recruitment

A pragmatic sample of patients with blood cancers were recruited from the Chemotherapy Day Unit/Haematology in-patient ward at an Australian hospital by a Research Assistant. Eligibility criteria included: age over 18 years; diagnosis of Hodgkin/Non-Hodgkin lymphoma/Chronic Lymphocytic Leukaemia and; currently receiving/about to commence chemotherapy treatment. Exclusion criteria included: ECOG > 3; unable to understand the English language sufficiently to use ASyMS-H; unable to use ASyMS-H due to existing disability or severe cognitive/emotional issues.

Eligible patients were approached on the ward or in the outpatient clinics by the Research Assistant, and provided with written study information in addition to a verbal explanation. Interested patients subsequently provided written consent for study participation prior to the first day of a chemotherapy cycle. Participants were provided with a digital oral thermometer and a smart phone/SIM card containing the remote monitoring/management application (ASyMS-H), and educated on how to use the system.

Ethical approval for the study was provided by the Human Research Ethics Committee at the recruitment hospital (E32/08).

3.2. The remote monitoring and management system (ASyMS-H)

3.2.1. System development

ASyMS-H was developed based upon the previously trialled ASyMS system for solid tumours (Kearney et al., 2009; Maguire

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