Reducing avoidable hospital admissions of the frail elderly using intelligent referrals

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Abstract
From around 50 years of age, the utilisation of hospital services begins to spiral upwards. In Australia patients over 65 years account for 46% of acute hospital bed days and 33% of hospital separations, although they represent only 12% of the total population. By 2051 the percentage of over-65s in the Australian population is projected to double. The largest increase will be in the over-85 group from 1% in 2002 to between 6 and 9% by 2051; a massive 500-700% increase. This cohort is more likely to experience frailty and their increase in the population is expected to impact demands for and the cost of providing health services. There are expected to be similar changes in the populations of most developed countries and addressing the challenges of ageing and aged care is now a high priority of many governments. Aged patients commonly present to hospitals with multiple, complex conditions and tend to be admitted because clinicians have insufficient time to explore other options and the patient's suitability for these. Around developed countries there is interest in strategies to reduce demand on hospitals by providing healthcare for the aged and chronic ill in homes and community settings. There is a paucity of research about effective ways to achieve this. Home care is expected to be a less costly alternative to institutional care and is often preferred by patients. This paper reports on an evaluation of an approach to reducing avoidable hospital admissions of the frail elderly through information technology. It involved a real-time assessment tool, an intelligent agent to identify candidates for assessment, and referrals to home-care providers assisted by electronic transfer of information.
Research in progress.

Keywords: Aged care, health referral, community care

1. Introduction

Current models of care do not cater well for coordination of patients with multiple conditions and referrals across settings. Given the increasing percentages of older people in the population, and that the use of hospital services begins to spiral upward from around 50 years of age, new models of client management across settings and better coordination of care are required. Patients over 65 years account for 46% of acute hospital bed days and 33% of hospital separations, although they represent only 12% of the total population. By 2051 the percentage of over-65s in Australia is projected to double. The largest increase will be in the over 85 group which will increase from 1% in 2002 to between 6 and 9% by 2051; a massive 500-700% increase [1]. This cohort is more likely to experience frailty and their increase in the population will impact greatly on the cost of health services in Australia [2].

Aged patients commonly present to hospital ED (Emergency Department) with multiple, complex conditions and tend to be admitted because clinicians have insufficient time to explore other options and the patient's suitability for these. There is no agreed definition in the literature of inappropriate attendance at ED. Van Konkelenberg and Esterman [3] in their research in South Australian hospitals found a range of factors for ED attendance which related to GP services, to the ED, and to personal situations. Health system strategies to manage attendance at ED and admission have included demand man-

agement strategies such as telephone triage, ED-based GP services, minor trauma centres, and triage-based systems within the ED. In Victoria there are a range of approaches to demand management under HARP (Hospital Admission Risk Program). These analyse hospital admission data to identify "frequent flyers" and to offer them better management of their conditions to avoid or reduce admissions. HARP interventions are "after the event" whereas the approach reported on in this research involves "real-time' interventions at the point where a decision will be made about admission of an individual patient [4].

Generally there is a paucity of research in this field but great interest across the world in trials and demonstrator projects as indicated by a Google search for "hospital avoidance" which found 1,130,000 internet sites (4 Jan 2007). In Australia referral to home care has been identified as a less costly alternative to institutional care [5] and is often preferred by patients. Federal and state governments are also increasingly interested in ways to reduce avoidable hospital admissions of the aged and several trials have been sponsored (South Australia, Northern Territory and the ACT). A national workshop on hospital admission minimisation of the aged was organised by the authors and sponsored by the Department of Health and Ageing at the Health Informatics Conference in 2005. This workshop identified a lack of consistent and reliable identification of candidates for hospital avoidance as a major barrier to admission minimisation. It was also noted that Australia has:

(a) laborious manual processes of organising services with the large numbers of community service providers,

(b) inefficient manual processing of referral requests,

(c) inefficient sometimes non-existent tracking of service delivery to ensure that patients, particularly those with high risk conditions, have been attended to in a timely manner.

Despite the identified need to reduce the fragmentation of care for the aged

population and facilitate referrals between providers this is not yet occurring in a nationally consistent manner [6]. Information and Communication Technology (ICT) is expected to provide the tools to streamline clinical workflow and effectively coordinate decision making and communication between multidisciplinary care teams [7, 8]. ICT is central to the South Australian government funded hospital admission minimisation pilot project [9] which is the precursor to the current study reported on in this paper. That project was the catalyst for the formation of the Advanced Community Care Association (ACCA) which provided a *single-point referral* to community service organisations. Nexus eCare™, developed by Nexus Online Pty Ltd, provided a proof-of-concept web-based, community care management system which identifies candidates for hospital avoidance, maps services to patients, automates communication between hospitals and community service providers, and tracks and audits service delivery by agencies.

2. Background

The acceptance and potential value of minimising avoidable admissions was clear during the preliminary phases of this research in the form of a pilot study. Figure 1 demonstrates an increase in referrals to ACCA of 471% [10] over the quarter and a saving of $925,270 in 5,548 acute care bed days [11]. Nexus eCare™ is planning to interface with the Australian Electronic Health Record (Health*Connect)* enabling the transfer of discharge summaries and the effective tracking and triage of patients to care providers nationally.

The level of growth achieved by ACCA contrasts sharply with the 150 or more 'hospital in the home' (HITH) programs in Australia. These are mainly characterised by a small group of hospital-administered nursing staff, often ward-specific, delivering early discharge services to a few hundred patients a year. With a few exceptions, referrals of more than 1,000 a year are yet to be achieved in these models.

The initial phase of the research involved the use of a Rapid Assessment Tool which will also be used in subse-
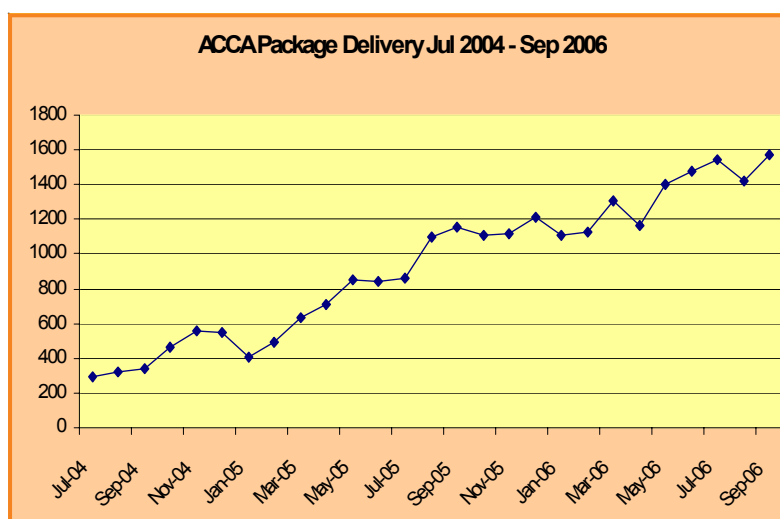

Figure 1: ACCA Service Volumes. (Source: ACCA 2006 Annual Report)

quent phases. This tool was developed by the research consortium and supports the rapid identification of ED presentations and in-patients to avoid an admission, or enable early discharge. It incorporates an "intelligent" filtering agent to identify candidates that might be suitable for referral to home-based care. This agent has algorithms and rules that analyse the data gained from digital data sources within the participating hospital, including the patient administration system, emergency department information system, laboratory system, radiology system, and pharmacy system.

The "intelligent" filtering agent continuously monitors the digital data obtained for all patients who either attend the emergency department or are inpatients within the hospital. The algorithms, developed in conjunction with clinicians, calculate each patient's stability and clinical risk levels based on their primary diagnosis, co-morbidities, age, medication usage, blood assessments, and other clinical factors. Rules constrain the agent so that it only identifies potential patients with clinical conditions/needs that the hospital is agreeable to passing to community care.

Patients identified as candidates are prioritised and displayed in a list that can be accessed by referring clinicians. This list has the ability to be sorted by date/time, ward, and priority. The referring clinician also has the option of manually identifying candidates for home-based care and adding these patients to the list by entering the patient's hospital identity number.

Current models of care coordination are inefficient leading to poor resource management across healthcare. According to Steinman at al [8], from about 50 years of age hospital admission rates spiral upwards. Great pressure is exerted on the health system in both fiscal and human resource terms with the average cost per episode for the over 65 year olds rising to between AUD\$4,000 and \$5,000 per annum for both sexes. The elderly present to hospitals with multiple, complex conditions and are frequently admitted because clinicians have insufficient

time to explore other options and the patient's suitability for these [9].

3. Aims

The aims of this research-in-progress project are to evaluate the feasibility, acceptability and other impacts of providing an alternative to hospital admission through facilitation of assessment of suitability for home care and coordination of the transition. Van Konkelenberg [11] in his evaluation of the first phase of the current project (the period of the ACCA coordination of home care referrals in South Australia) estimated that for every \$1 spent on hospital diversion activities, \$4 is saved in health costs. This of course does not take into account the very-difficult-to-quantify human factors such as consumer choice and empowerment.

3.1 Hypothesis

Aged frail consumers will require less hospitalisation and will be the recipients of improved continuity of care as a result of implementation of the ACCA model in emergency departments

3.2 Methods

Methods for evaluation of the Adelaide ACCA model involved structured interviews with key stakeholders as well as a one-day Industry Stakeholder workshop which was held in Adelaide on 28 September 2006. Invitations to the workshop were issued to organisations that were perceived to be stakeholders in hospital avoidance and electronic referrals to home care. Interviews were held with a small number of stakeholders to inform the structure of the one-day workshop. The initial interview participants included former executives of ACCA and people holding key positions in the organisations that provided infrastructure and operations support to the service. These initial consultations identified stakeholders to be invited to the workshop, structure of focus groups and the agenda for the day.

Stakeholder organisations that were

identified and invited to send appropriate staff included South Australian hospitals, regional and district health services, divisions of general practice and other primary care organisations, aged and home care providers. The organisations invited were those in the Adelaide area that provided services impacted or likely to be impacted by the ACCA assessment and referral model. In addition a small number of observers attended from other states who were interested in the model. Almost 60 people participated in the workshop. The contributions were recorded and later transcribed and clustered by themes. Participants were informed that the proceedings would be recorded and transcribed. All data was anonymised.

The one-day event was broken into six sessions plus an opening over a period of four hours including breaks. At the opening the purpose and structure of the day was explained as well as privacy principles, that the day would be recorded but all data would be anonymised. The first session involved presentation of a position statement based upon initial consultations with key stakeholders. As with all sessions participants were encouraged to be interactive and questions were invited from the participants. In the second session case studies were presented. In the third session participants were formed into industry groups: hospitals, RACFs (nursing homes), General Practice, allied health, nursing, pharmacy and associations. Each focus group had around 8 participants. Each group was invited to appoint a facilitator and reporter. The groups were invited to explore the theme of how can e-referrals flourish. This was aimed to distil key issues. In the fourth session each group reported back. The fifth session consisted of an interactive workshop between panel members and the workshop participants. The final session was an interactive session where a facilitator attempted to derive a consensus summary of the workshop outcomes.

The approach employed participatory evaluation [12] which is applied research for purpose of informing action, enhancing, making and applying

knowledge to solve problems identified in practice. A simple definition of evaluation research is "*the systematic application of research procedures for assessing the conceptualisation, design, implementation and utility of services programs or practice*" (adapted from [13], p5). In this particular study, the specific approach Collaborative Evaluation was used which moves beyond process evaluation and actually includes stakeholders in the evaluation process. A central notion driving this type of evaluation is negotiation; that is it enables participants to be involved as partners in the research alongside the evaluator. It allows views to be expressed that may be in conflict and it works to create a safe place for those views to be discussed and it has the potential for new thinking processes to be introduced into an organisation's culture [14], p236. Evaluation research can assist to find out how well a program, practice or treatment or policy is working [15], p149).

This study aimed to overtly recognise the expertise of the participants and also recognise that a non-participatory evaluation, or non-democratic process of evaluation cannot ensure a user-appropriate outcome such as is needed in this study [12], p168. Guba and Lincoln [16] agree, suggesting that evaluation is a shared process of accountability - not assigned accountability. This has implications for each worker's clinical decision making and practice as well as the outcomes of work of the agency. It is always difficult to balance the Primary Health Care approach against the bureaucratic needs thus presenting some challenges. Specifically, this project will focus on process, impact and outcome evaluation. Such formative evaluation examines what happens while the evaluation process is occurring during the project. The term impact evaluation is consistent with the evaluations based on measurements and process evaluation is valuable in practice when you want to feedback on a program implementation, site response, client response, practitioner response and the evidence relating to competencies of personnel involved such as soon

this particular study. It documents the extent to which a program is delivered as planned.

Evaluation research is not conducted in an apolitical context-many others may have vested interests in the implementation or may be capable of obstructing or subverting the program (Talbot and Verrinder 2005, Koch 2003). Therefore, it is important in this study to assess and monitor the sites political contexts. Feedback on the level of knowledge, skill and performance of the various health-care professionals who deliver the program can be ascertained during this process as in most agencies have established competencies to practice with competency being assessed through informal interviews, brief case analyses, quizzes, self-evaluation and appraisal as well as on-site observation of staff performance. In other words, how the workload (program implementation, referral system and follow up) was managed. The immediate and long term effects of the strategies of referral can be monitored concurrently. This is achieved by using survey initially followed up by face to face interview of randomly selected participants. This in turn relates to other health indictors such as quality of life and health status [17].

Fourth Generation Evaluation (FGE) as proposed by Guba and Lincoln [16] is the level of research to be utilised in this case. The evaluator's role is seen as almost being that of a management consultant whose role is to mentor and offer supportive information that will help the organisation to accomplish their policy objectives notions of service, utility and efficiency. The appeal of such a process is that the evaluation strives to give its participants (stakeholders) a direct voice or opportunity to have a say about things that affect them in the process or project. It is an evaluation strategy that can be incorporated into daily practice and with some additional resources (e.g. time and expert guidance). It can be completed as an insider's evaluation process since FGE argues for all stakeholders to have a right to place their concerns, is claims and issues on the negotiating table.

The Industry Stakeholders Workshop was structured into 6 sessions:

1. Overview - why are intelligent referrals so critical, facilitator presentation of background, objectives
2. The how and why of doing referrals online – explanation of the processes, technology
3. How might intelligent referrals develop in South Australia?
4. Facilitated focus groups on issues for intelligent referrals in South Australia
5. Report back and discussion
6. What next – wrap-up, summary of session and proposed further research.

Further research will involve gathering metrics on the numbers of assessments and the numbers of successful referrals. This data will be captured electronically by the computer system. Qualitative research will gather the perceptions and experiences of participants including the staff at participating emergency departments and community care providers who will receive the patients and their referral information. This data will be gathered through structured interviews and focus groups.

4. Findings

Anonymised data was analysed using thematic analysis and the results follow:

A. Perceived benefits
- Improved care coordination
- Improved tracking of referrals
- Improved confirmation of receipt and feedback
- Single-point for referrals and a common user interface
- Reduced duplication of information, errors, paperwork and time saved
- Happier patients and carers, reduced anxiety for patients and their families
- Meaningful reports and audit trail.

B. Barriers and concerns
- Immediate response – good system response times
- Good and efficient security

- Universal data set
- Determine suitable agencies for system: not **all** services providers will be suitable
- Need a field for personalised information eg what days available etc.
- Costs
- Maintenance/IT back-up
- Training
- Initial data entry – set-up of the system, may be very time consuming
- "Case notes" culture needs to change and clinicians need to look to electronic means first
- Reassurance around security and confidential access
- With the central/coordinating agent deciding where referrals go, they haven't seen the client and may not necessarily direct referral to most appropriate service
- Overcoming territorial attitude of agencies sharing information

C. Desired functional requirements

- Needs ability to have a discharge summary attached
- Notification of admission to hospital for community services' clients
- Discharge summary sent out on discharge to **all** community services that provide support to an individual
- A sharing of medical history/ treatment between all specialists/hospitals/community services (Electronic Health Record)
- Waiting lists and waiting times for services – bookings
- Client access to their own data.

The participants in the focus group workshops were self-selecting, that is the invitation was issued to stakeholder organisations and staff within those organisations elected to participate. It can be presumed that the workshop would have been more attractive to supporters of the concept rather than detractors. No funding for relief staff was provided so staff attending were those who either did not need to be back-filled to attend or those from organisations that were able to back-fill.

5. Discussion

The field of "hospital avoidance" is of growing interest in Australia and other developed countries The current research project identified strong support for the concept and a range of benefits to patients and their families, hospital ED staff, primary and community care providers. Concerns included computer system response times, security and privacy of information, set-up and operating costs, cultural and organisational issues. Participants suggested a range of additional functionality they would like to see including the capacity for a discharge summary to be attached to a referral, notification to all community care providers of a patient of when the patient has been admitted or discharged from hospital, access for all carers to a shared EHR (electronic health record), and a capacity to access bookings, waiting lists and waiting times for services.

There is likely to be an increasing volume of research in this field as the many projects and pilots across the world are evaluated and results published. This current research will continue to evaluate ICT as a vehicle to minimise avoidable admissions of the aged to hospital. Further research will use a mixed methods research: qualitative methods to evaluate the adoption of the technology and to estimate cost savings and quantitative approaches including observation, interviews, individual interviews and group work to glean participants' perceptions. This strategy will provide feedback on other health indicators such as quality of life and health status issues. There will also be a need to research economic and health outcome impacts as these will be important for health planners and policy-makers.

Admission to hospital is not always the most appropriate action and could be avoided if processes and supporting systems are in place to facilitate the diversion to more appropriate candidates to home care, or residential care facility. Improved coordination with community-based services, the communication of more accurate clinical information and the improved availability of information for care coordinators is expected to lead to better patient outcomes. Evaluation of financial benefits will assist in planning the feasibility of a nation-wide rollout.

6. Conclusion

This research evaluated hospital avoidance technology as a means to improve planning and delivery of care for the aged when they present for health services. Indications are that these approaches can relieve pressures on our hospitals, reduce the bottlenecks in Emergency Departments and significantly reduce inappropriate and unnecessary admissions.

Acknowledgements

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