BMJ Open Hospital-based chronic disease care model: protocol for an effectiveness and implementation evaluation

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ABSTRACT

Introduction Novel and efficient healthcare approaches are needed to better serve increasingly older chronic disease patients. Many effective integrated chronic disease management strategies have emerged from the primary care sector. However, in many Asian and developing countries, primary care is underdeveloped, and patients prefer secondary-based services. The Integrated Generalist-led Hospital (IGH) care model is a new approach, which may be better suited for chronic disease patients in the local context.

Methods and analysis A hybrid type I study on the effectiveness and implementation of the IGH care model will be conducted. Implementation evaluation will be informed by the Consolidated Framework of Implementation Research (CFIR). Quantitative and qualitative data will be collected through in-depth interviews and focus group discussions with staff, a staff survey, patient interviews, clinical outcomes and cost data. Clinical outcomes include the length of stay, readmission, emergency room visit rate and mortality. Clinical outcomes will be summarised and compared with a propensity-matched ‘usual care’ group (derived from the general medicine ward(s) at a separate hospital). The Kaplan-Meier approach will be used to estimate time until death and time until first readmission (both within 30 days of discharge) and time until discharge. Multivariate regression models will be used to investigate the association between the care model and occurrence of readmission, emergency room visit and death, all within 30 days of discharge. Qualitative data will be analysed using a thematic analysis method. Qualitative and quantitative data will also be coded according to the five domains of the CFIR.

Ethics and dissemination This protocol was reviewed and approved by the National Healthcare Group Domain Specific Review Board (NHG DSRB 2019/00308). Results will be published in peer-reviewed scientific journals and conference presentations. Findings will also be discussed with key stakeholders through local dissemination events.

INTRODUCTION

Asia-Pacific is the fastest ageing region in the world.¹ Between 2015 and 2030, the number of elderly people (aged 65 years and above) will increase by at least 200 million.¹ In Singapore, the proportion of citizens aged 65 years and above will reach 40% by 2050. With age,

Strengths and limitations of this study

- We will conduct a pragmatic hybrid evaluation of effectiveness and implementation of the Integrated Generalist-led Hospital (IGH) care model to more rapidly generate translational research findings.
- We will use a mixture of qualitative and quantitative data to derive more in-depth understandings of the experiences of the IGH care model.
- Long-term outcomes (eg, quality of life, functional status and care continuity) will not be assessed, further evaluation is needed to determine longer-term outcomes.

non-communicable chronic disease and disability become more common.² The implication is a growing elderly population with more complicated chronic healthcare needs. The demographical shift also coincides with a decline in healthcare workforce numbers—a consequence of declining birth rates.³ Novel and efficient healthcare approaches are needed, so care remains effective and sustainable in the long term.^{4–6}

Healthcare systems, historically serving acute episodic care needs, are often not optimised for increasingly aged patients with chronic care needs.⁷ For example, inpatients requiring rehabilitation in Singapore are usually transferred to a second institution following resolution of the acute admission. Transferring patients between sites is inefficient, requiring scheduling and arrangement of transport, and can lead to unnecessary delays if waiting-lists exist. Information may also be poorly shared between sites, impacting treatment and the resultant outcome. A second example, in the outpatient setting, is the multiple disease-specific appointments multimorbid patients attend. Multiple appointments are not only burdensome to the patient, but information sharing between specialists is limited, which can lead to inappropriate treatment and polypharmacy. These inpatient and outpatient

practices are inefficient, ineffective and unsustainable for managing the complex needs of chronic patients.^{8,9}

In many countries, care integration has emerged as an effective strategy in chronic disease care. Integration overcomes barriers to care coordination, communication and information sharing⁷ that can lead to care fragmentation and poorer clinical outcomes.¹⁰ Care integration leads to improved patient satisfaction, perceived quality of care and greater access to health and social services.¹¹ Thus, integrating care is a priority in many countries and even for the World Health Organization (WHO).^{12–16} Although no single definition or approach for care integration exists, many successful initiatives have come from the primary care sector. However, primary care led approaches can be challenging, especially in the Asian context.

Primary care has received less investment, is less developed, and is perceived as providing less comprehensive care compared with secondary services in many Asian and developing countries.^{17–19} To a lesser degree, primary care in Singapore has lagged behind hospital development. Healthcare financing policies favour hospital-based care; primary care is largely privatised (~80%) and more expensive than subsidised hospital care. All these factors, combined with a lack of primary care ‘gatekeeping’ of secondary services, have shaped patient behaviour to prefer specialist institution-based care for chronic diseases.¹⁸ The result is a system where chronic disease patients are managed by multiple, hospital-based specialists in a siloed manner, rather than by a single primary care physician.

Efforts are ongoing to integrate and improve primary care capacity locally. Initiatives include the Singapore Family Medicine Clinic (FMC), started in 2013, which established an integrated care model between private general practitioner (GP) groups and a public hospital.¹⁸ More recently (2017), the Singapore Primary Care Network was set up to enhance primary care. Despite these efforts, patients

continue to seek hospital-based specialist care. An evaluation of the Singapore FMC reported patients were satisfied with the care received at FMC, but they continued to use hospital-based care. Reasons included concerns of the cost of FMC care and a perception that care was not as comprehensive as hospital-based care. Other attempts to integrate care can be found across Asia,²⁰ but fully integrated health-care coverage still has a long way to go.

A sustainable healthcare model, which offers an alternative to the fragmented care currently offered, is urgently needed. Aligning with a longstanding preference for secondary rather than primary care services in the region, one such hospital-led model has now been implemented in Singapore.

The intervention

The Integrated Generalist-led Hospital (IGH) care model, at Alexandra Hospital, was established in June 2018. Patients are managed from one location by a multidisciplinary care team across the entire care continuum, that is, from acute management to on-site rehabilitation before discharge. The care model comprises of four key features (table 1). Figure 1 depicts a logic model of the inputs, activities, outputs/outcomes and impact of the care model.

Usual hospital care in Singapore

Inpatient care is typified by separate acute and longer-term care institutions for example, acute and rehabilitative hospitals on separate sites. Patient care is consequently delivered across multiple sites and by different care teams. Transference between sites can lead to delays in treatment (when there are waiting lists) and suboptimal information sharing. Chronic disease patients are often managed by multiple hospital-based specialists leading to a lack of care coordination. The role of nurses has also been limited. For example, advanced practice nurses were only able to

Table 1 Description of the IGH care model components

IGH care model component	Details
1. Acuity grading system	<ul style="list-style-type: none"> ▶ Admitted patients graded according to a three-level acuity system: acute (Level 3, (L3), subacute (L2) and non-acute and rehabilitation (L1)). ▶ Parameter monitoring and physician contact time adjusted according to acuity level (lower acuity has less contact time). ▶ Daily evaluation of acuity grade.
2. Generalist-led multi-disciplinary team	<ul style="list-style-type: none"> ▶ Multidisciplinary care team led by an internal medicine physician or specialists acting as a ‘generalists’. ▶ L1 patient care led by nurse clinicians.
3. Care consolidation	<ul style="list-style-type: none"> ▶ Screening of suitable candidates, that is, multimorbid, currently receiving care from multiple specialists ▶ Identification of a principal physician. ▶ Discussion with the patient to consolidate chronic outpatient care at Alexandra Hospital, under a single principal ‘generalist’ physician if appropriate (specialists continue to advise where needed).
4. One patient, one bed, one team	<ul style="list-style-type: none"> ▶ Patients are admitted and managed on one site, by one team, for the entire care continuum.

IGH, Integrated Generalist-led Hospital.

Figure 1 Integrated Generalist-led Hospital care model logic model.

prescribe medications from 2018. Lastly, structured acuity grading with optimised physician contact is not typical.

Aim

The aims of this project are to evaluate the effectiveness, cost and implementation of the IGH inpatient care model in routine practice.

Objectives

The specific study objectives are:

1. To assess patients' clinical outcomes and the associated costs of delivering the IGH inpatient care model.
2. To evaluate the implementation of the IGH inpatient care model, including staff experiences and identification of facilitators and barriers to effective implementation.
3. To elicit the experiences of patients' receiving IGH inpatient care.

METHODS

Study design

We will evaluate the care model using a hybrid type I study design.²¹ Specifically, hybrid designs evaluate effectiveness and implementation concurrently. The approach is advantageous in that it facilitates more rapid translation of research into practice.²¹ The evaluation will be guided by a modified version of the Consolidated Framework of Implementation Research (CFIR).²² Quantitative and qualitative data will be collected through: (1) a retrospective analysis of clinical data and cost outcomes from the electronic medical records; (2) a staff experience survey; (3) staff focus group discussions; (4) in-depth interviews with senior staff members and (5) patient care experience interviews.

Clinical outcomes

A retrospective analysis of patients admitted to Alexandra Hospital and treated using the IGH inpatient care model will be conducted. Data on all adult patients (≥ 18 years) admitted from 1 January 2019 until 31 December 2019 will be identified and extracted from the medical records. An 'IGH-attender' is defined as a patient who has a documented admission date to the IGH inpatient care wards and has remained on the ward for ≥ 24 hours. A comparison group receiving 'usual care' will be derived from general medicine ward(s) at a separate hospital, to reduce the risk of contamination bias. Patients identified as control participants who are subsequently admitted to Alexandra Hospital within the follow-up period will be excluded. Patients younger than 18 years of age or those admitted for surgery, psychiatric-related diagnoses or palliative care will be excluded from the analyses.

The following clinical outcomes will be assessed:

1. Length of stay.
2. Readmission rate (within 30 days of discharge).
3. Mortality (rate during inpatient stay and within 30 days of discharge).
4. Emergency room visit rate (within 30 days of discharge).

Alexandra Hospital combines acute and rehabilitative care at one site (not typical of usual care). To account for the rehabilitation period in the usual care group, we will use data on the average length of stay for common diagnoses in rehabilitation facilities. From the usual care cases, we will identify participants who are referred to a rehabilitation facility and combine their length of stay (in the acute hospital) with the corresponding average length of stay, which is the closest match to the participants' diagnoses. Averages will be used as a proxy, as we do not have access to data from rehabilitation facilities.

For readmission, emergency room visit and mortality, we will use a 30-day follow-up period. This is based on the literature, where this timeframe is commonly used to assess the quality of hospital care and discharge planning.^{23 24}

At present, admission to Alexandra Hospital can occur through several routes, including direct admission or referral from other hospitals, polyclinics (public community practitioners) and private GPs. On average, between 1 August 2019 and 31 October 2019, 751 patients were discharged per month and the average age of patients was 59.4 years (range 16–103 years). Common diagnoses included gastritis, cellulitis and pneumonia. Based on current admission rates, it is anticipated approximately 3000 patients from Alexandra Hospital will be eligible for inclusion in the analysis.

Patient profiling and propensity score

The sociodemographic and clinical profile of IGH-attenders and usual care patients will be presented. Length of hospital stay will be presented as a mean with SD, the proportion of patients with at least one readmission or emergency room visitation within 30 days of discharge will be calculated. Mortality rate will be presented overall and separately for deaths occurring during the hospital stay and within 30 days of discharge. Statistical comparisons between the IGH-attenders and usual care patients will be made using the two-sample t-test, Wilcoxon rank-sum test and χ^2 test, as appropriate. Standardised differences will be used to describe the magnitude of difference between groups for continuous variables, with differences greater than 0.1 considered meaningful.

A multivariate logistic regression will be used to predict mode of care: IGH inpatient care or usual care and calculate the propensity score for each patient. Age (years), sex (male/female), ethnicity (Chinese/Indian/Malay/Other), marital status (married/single), level of education (low, no formal qualifications/primary school leaving exam/secondary education; medium, O-levels/A-levels; high, diploma/university degree or equivalent, smoking status (current smoker yes/no), body mass index (BMI), billing class (subsidised/non-subsidised), number of comorbidities, primary diagnosis at the time of admission to IGH inpatient care or usual care admission, Charlson Comorbidity Index Score (CCI), weekend admission (yes/no), evening admission (yes/no) and date of admission (converted to numeral since the start of the study period) will be included as covariates.

IGH-attenders will be matched to patients receiving usual care according to the closest propensity score. The ability of the propensity score to balance predictors between groups will be checked by looking at the overlap between the mean and 95% CIs of both groups. Additionally, the propensity score in each group will be stratified, and the similarity of independent variables in each quintile for each group will be checked. Unmatched controls (usual care) will be discarded from the matched analysis.

Time-to-event analysis

The Kaplan-Meier approach will be used to estimate time until death up to 30 days following discharge, the time until first readmission up to 30 days postdischarge and time until discharge. A stratified log-rank test will be used to test for a statistical difference between treatment groups.

Regression modelling

A cox proportional hazards model will be used to estimate the HRs and 95% CIs of readmission within 30 days of discharge, emergency room visit within 30 days of discharge and occurrence of death within 30 days of discharge associated with the care model. A logistic regression will also be used to investigate the association between the care model and the same clinical outcomes. The occurrence of readmission, emergency room visitation or death will be coded as 1 (yes, occurred) and non-occurrence coded as 0. All analyses will be adjusted by the propensity score.

Sensitivity analysis

If feasible, a subanalysis will be conducted analysing only those readmitted due to reasons related to the underlying primary disease.

Cost-effectiveness analysis

A cost-effectiveness analysis from the healthcare system's perspective will be performed using 30-day readmission as the primary outcome. We will compare 30-day readmission rate per 12-month period between Alexandra Hospital and usual care and estimate the average cost per readmission in both groups. Costs will be based on the daily treatment fee, which accounts for healthcare staffing costs, including staff to patient ratio and staffs' salaries. The daily treatment fee accounts for the major proportion of inpatient costs. For the usual care group, the daily treatment fee for those attending rehabilitation at a separate institution will also be obtained. Discounting will not be considered as over a 1 year time period costs are not anticipated to change.

Implementation evaluation

The implementation evaluation will be guided by the Consolidated Framework of Implementation Research (CFIR).²² Applying the CFIR framework will assist in the identification of factors that can influence the implementation of the IGH inpatient care model and its effectiveness. The CFIR framework consists of five domains and related constructs:

1. Intervention characteristics—features of the intervention that might influence implementation (8 constructs).
2. Inner setting—features of the implementing organisation that might influence implementation (12 constructs).
3. Outer setting—features of the external context or environment that might influence implementation (4 constructs).
4. Characteristics of individuals who are involved in the implementation and might influence implementation (5 constructs).

5. Process—strategies or tactics that might influence implementation (8 constructs).

Data sources used to evaluate the IGH inpatient care model according to the CFIR domains will include staff focus group discussions; staff in-depth interviews; a staff survey; clinical outcome measures and a review of practice policies at Alexandra Hospital (eg, standard operating procedures, acuity transition procedure and training materials for care consolidation). Participants will not be asked about specific CFIR constructs. Participants will instead be recruited to partake in a series of qualitative studies on the experiences, barriers and facilitators of the IGH inpatient care model.

Participants

Staff involved in the development, management and delivery of IGH inpatient care will be recruited to partake in a series of interviews, focus group discussions and structured surveys to explore the perspectives and experiences of the new care model. Interviews, focus group discussions and the staff survey will all be conducted in English. Data collection tools were piloted in 2019. Researchers conducting the interviews and focus group discussions are employed by Alexandra Hospital but are independent of the care team. All researchers have been involved in pilot work and have been trained in interview skills. The research team is led by a faculty member with qualitative research experience, from the Yong Loo Lin School of Medicine at the National University of Singapore (YWL). Informed consent will be obtained prior to interviews and focus group discussions.

Staff survey

Approximately 400 staffs involved in the delivery of the IGH inpatient care model will be invited to complete a structured online or hard copy survey. The survey aims to capture perspectives from a range of professions and different levels of seniority. Closed and open-ended questions will focus primarily on the implementation process; perception of the programme including the acuity grading system; multidisciplinary team meetings; the care consolidation processes and facilitators and barriers to implementation of the IGH inpatient care model. The survey is expected to take no more than 30 min to complete. Data will be anonymised and summarised as means with SD or as numbers with percentages. Results will be summarised according to the profession and overall for the whole sample.

Focus group discussions

Approximately 42 healthcare professionals: physicians, nurses, allied healthcare professionals and administrators will be approached to take part in a series of focus group discussions. A topic guide will be used to steer the discussions in each meeting (box 1). Separate focus groups will be held for each respective profession, and one focus group will involve a mixture of professions. Focus groups will include participants at different levels of seniority. Discussions are expected to last approximately 1 hour and will be recorded.

Box 1 Focus group discussion topic guide

Topic guide

- ▶ Topic 1: Motivators and understanding of the IGH model
- ▶ Topic 2: Experience of implementing the IGH model
- ▶ Topic 3: Experiences of the acuity grading system
- ▶ Topic 4: Multidisciplinary team meetings
- ▶ Topic 5: Experiences of the care consolidation process
- ▶ Topic 6: Benefits and challenges of the IGH model
- ▶ Topic 7: Scalability and sustainability of the IGH model
- ▶ Topic 8: IGH model improvements

In-depth interviews

One-to-one in-depth semistructured interviews will be conducted with senior stakeholders, for example, chief of nursing, head of allied health, who were involved in the development of the IGH inpatient care model and/or are managing staff at Alexandra Hospital. A topic guide, similar to the focus group guide (box 1), will be used to steer the discussions in each meeting. Interviews are expected to last approximately 1 hour and will be audio-recorded.

Patient interviews

Up to 200 patients who received IGH inpatient care at Alexandra Hospital will be approached for a structured interview. The purpose is to explore patient care experience, understanding of the IGH care model and their ongoing care plan following admission at Alexandra Hospital. Interview domains will include demographics, communication with healthcare professionals, rehabilitative care, acuity grading and care consolidation, medication communication, care transition and general care experiences.

Researchers, working with the nursing team, will identify potentially suitable patients within the IGH inpatient care wards to interview. Eligible candidates will be approached on the day prior to discharge by a trained researcher to discuss the project and take consent. During the interview, the patient will be asked to complete a modified version of the Patient Experience Survey (PES) with the assistance of the researcher. The PES is a standardised instrument which is routinely used in hospitals in Singapore to evaluate the care experience.²⁵ After completion of the structured survey, the researcher will ask a series of open-ended questions regarding understanding and experiences of the IGH inpatient care model and their ongoing care plan. Interviews will be conducted in English, Chinese or Malay, according to participant preference. Interviews are expected to last approximately 30 min and will be audio-recorded. Quantitative data will be summarised as means with SD or as numbers with percentages.

Qualitative analysis

Interview and focus group data will be analysed using a thematic analysis method. The method involves iterative rounds of coding to develop a final set of subthemes and main themes. The data will be coded according to the meaning of the sentences to identify experiences as perceived by patients and healthcare professionals.

Frequently occurring codes that appear to deal with the same content will be grouped into subthemes. Similar and overlapping subthemes will be grouped into one theme. The thematic analysis process is designed to capture the holistic perception of the participants.²⁶ If data saturation has not been reached, then further sampling will be undertaken. For focus group data, further analysis will be conducted to see if common themes are apparent across the professional groups.

Qualitative data will also be analysed according to the CFIR domains. Data from staff in-depth interviews, staff focus group discussion and the staff survey will be interpreted, and the most applicable construct applied.

Ethics and dissemination

This study has been approved by the National Healthcare Group Domain Specific Review Board (NHG DSRB 2019/00308). On completion of the research, we intend to report the results via publication in peer-reviewed scientific journals and in the form of conference presentations. Findings will also be discussed with key stakeholders involved in the IGH care model through local dissemination events.

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Competing interests None declared.

Patient and public involvement Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Patient consent for publication Not required.

Provenance and peer review Not commissioned; externally peer reviewed.

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