

Survey of virtual ward acceptance among medical patients admitted to hospital

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ABSTRACT

Introduction: Virtual ward (VW) is a hospital-led alternative to inpatient care enabled by technology where patients are looked after in their usual residence. Such a service may not be familiar to many. This survey aims to explore the views and acceptability of VW among hospitalised patients.

Materials and Methods: This study was conducted among patients aged ≥ 18 years admitted to medical wards of a tertiary hospital in Malaysia. The survey questions were adapted from existing questionnaires and piloted before use. Participants were provided with a clinical vignette and description of a VW service before completing the questionnaire. It collated data on respondents' demographics, admission details, VW acceptability and their views on VW-related telehealth. The next of kin or main caregiver provided responses if the person was unable to participate.

Results: Responses were collected from 120 participants (95 patients, 25 caregivers), of which 108 respondents (90.0%) agreed to be managed by a VW service if such a service was available and able to meet their needs. Being at home, supported by family members, and the ability to maintain independence were the most common reasons cited for its acceptance. Among those unwilling, participants preferred to have the medical and nursing team close by. In terms of telehealth readiness, 95% of patients have internet access, and 97.5% possess the appropriate devices for video consultation. However, only 20% of patients have utilised online video consultations before to seek medical advice.

Conclusion: The majority of people surveyed were willing to accept a virtual ward service. The findings provide useful information towards the planning of virtual ward programmes in Malaysia.

KEYWORDS:

Virtual, hospital, telehealth, telemedicine

INTRODUCTION

A virtual ward (VW) is a hospital-led alternative to inpatient care that is enabled by technology.¹ Through the use of remote monitoring and telecommunication, VWs facilitate

the delivery of comprehensive hospital-level care, encompassing physician consultations, medication administration, nursing and therapy services, clinical diagnostics, and investigations, among other essential healthcare provisions. Hospital teams rely on carers and family members to support elements of care in the home, with clinical oversight provided remotely. The technology used in VW can also complement the delivery of hospital-at-home services that provide face-to-face care at the person's home through multidisciplinary teams as a substitute for inpatient care. As a result, hospital admissions may be avoided altogether or inpatient stays shortened through earlier discharge.

The COVID-19 pandemic served as a catalyst for the development, adoption, and expansion of VWs. Patients could be effectively and safely managed at home remotely.¹ VW initiatives have been established in countries, such as Australia, the United States, Canada, the United Kingdom, and Spain.² For many, VWs were implemented as part of a broader hospital-at-home service. Research findings indicate that the adoption of such services lead to potentially better clinical outcomes, such as shorter hospital stays and decreased rates of readmission.³ The mortality rates observed were comparable to those of patients admitted to conventional hospital wards.⁴ VWs could alleviate mental stress and mitigate adverse hospital events, including functional decline, incontinence, and delirium, among older individuals undergoing acute hospital admissions.⁵⁻⁷ Hence, many have considered VWs as a safe and effective alternative to address the overwhelming burden placed on acute hospitals.

The growing acceptance of telehealth, tele-consultations and digital monitoring of health conditions among healthcare professionals suggests that the healthcare landscape may be ready to adopt VWs. This is also supported by wider internet coverage, smart device penetration, and devices with better phone and video capability. However, whether VWs is an acceptable model of care for the wider public is uncertain. Using technology to support acute care being delivered outside hospitals remains unfamiliar to many. Therefore, this survey aims to explore the perception and acceptability of VWs among hospitalised adult patients in a tertiary hospital.

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Table I: Demographic and characteristics of respondents (n=95)

Demographic and clinical variables	
Age, mean (SD), years	44.0 (16.6)
Age ≥65 years, n (%)	12 (12.6)
Men, n (%)	49 (51.6)
Ethnicity, n (%)	
Malay	57 (60.0)
Chinese	21 (22.1)
Indian	17 (17.9)
Employment status, n (%)	
Employed full time	43 (45.3)
Employed part time	2 (2.1)
Self employed	14 (14.7)
Unemployed	8 (8.4)
Retired	28 (29.5)
Housing type, n (%)	
Multi-storey house	31 (32.6)
Single-storey house	22 (23.2)
Flat/apartment/condominium with lift	28 (29.5)
Flat/ apartment/ condominium without lift	12 (12.6)
Others	2 (2.1)
Education level, n (%)	
Primary	5 (5.3)
Secondary	31 (32.6)
Pre-university	10 (10.5)
Diploma	18 (18.9)
Degree	30 (31.6)
No formal education	1 (1.0)
Living with, n (%)	
Spouse	31 (32.6)
Spouse and children	20 (21.0)
Parents	24 (25.2)
Children	4 (4.2)
Friends	5 (5.3)
Live alone	3 (3.2)
Paid caregivers	1 (1.1)
Others	7 (7.4)
Mobility before admission, n (%)	
Walks without aid	83 (87.4)
Walks with aid	10 (10.5)
Using wheelchair to get around	2 (2.1)
Daily Activities, n (%)	
Can do both basic and complex daily activities alone	86 (90.5)
Needs some help with basic daily activities	7 (7.4)
Can do basic daily activities alone only independently	2 (2.1)
Diagnosis category*, n (%)	
General medical diseases	37 (39.0)
Gastrointestinal diseases	14 (14.7)
Neurological diseases	13 (13.7)
Respiratory diseases	11 (11.6)
Endocrine/metabolic diseases	8 (8.4)
Infectious disease	6 (6.3)
Others	6 (6.3)

*Based on which ward or specialty disposition

MATERIALS AND METHODS

This survey was conducted among patients aged ≥18 years admitted to the medical wards of a university hospital in Malaysia between 1 July 2024 and 16 August 2024. Patients who were unable to provide informed consent independently had their next of kin or caregivers invited to participate on their behalf. The caregiver was defined as the main or nominated spokesperson for the family. The survey excluded those who were critically unwell, terminally ill, or have isolation precautions (e.g., respiratory precautions).

The study questionnaire was adapted from two previously used questionnaires. The previously used questionnaires assessed acceptance of hospital-at-home services (in a Singapore setting), which share many similarities with VWs, and virtual consultations (conducted within the same institution as this study).^{8,9} Minor contextual modifications were made by the research team to align itself with the proposed hospital's VW services. The adapted questionnaire domains included: (a) demographic information, (b) acceptability, (c) views on telehealth, (d) perceptions of healthcare delivered at home, (e) views on payment for VW,

Table II: Characteristics of the caregivers (n=25)

Caregivers, n (%)	
Age, mean (SD), years	54.2 (12.8)
Employment status	
Employed full time	7 (28.0%)
Employed part time	2 (8.0%)
Self employed	1 (4.0%)
Unemployed	8 (32.0%)
Retired	7 (28.0%)
Educational level	
Secondary education	8 (32.0%)
Pre-university	1 (4.0%)
Diploma	4 (16.0%)
Degree and above	8 (32.0%)
No formal education	1 (4.0%)
Declined to answer	3 (12.0%)
Work From home option	
Yes	3 (12.0%)
No	6 (24.0%)
Not applicable	16 (64.0%)
Caregiver relationship with patient	
Child	10 (40.0%)
Spouse	7 (28.0%)
Parent	4 (16.0%)
Paid caregiver	1 (4.0%)
Grandchild	1 (4.0%)
Other	2 (8.0%)

and (f) admission details. For participants who were unable to answer the survey but fulfilled the eligibility criteria, the survey form was adapted to gather the caregiver’s views. To assess acceptability and gather respondents’ views on a VW service, a brief description of the service was explained to the participants prior to the start of the survey.

The sample size for this survey was determined by the primary outcome of the proportion of patients that would accept a VW care if offered based on a previously conducted survey.⁸ To provide a 95% confidence level of and a margin of error of 10%, assuming that there would be an unequal proportion of patients who would accept or reject the service, this would result in a minimum sample size of 97. Taking into account potential challenges with completing the survey, the study planned to recruit 120 participants. Participants were conveniently sampled for this survey.

Patient demographics and characteristics were analysed using appropriate descriptive statistics, including frequency tabulations for categorical variables and summary parameters such as means and standard deviations for continuous variables. Acceptability was graded based on a Likert scale (Definitely no, No, Unsure, Yes, Definitely yes). The data was analysed using SPSS Version 27. Ethical approval was provided by the institution's medical research ethics committee (MREC 202431-13498).

RESULTS

A total of 155 participants were screened. Among this, 95 (79.2%) participants responded to the survey, while 25 (20.8%) caregivers responded on behalf of patients, yielding an overall response rate of 77.4%. The demographic and clinical characteristics of respondents (n=95) are detailed in Table I.

A total of 25 caregivers responded on behalf of the patients (Table II). The patients that the caregivers looked after had a mean age of 65.6 (20.7) years. The proportion ≥65 years was 17/25 (68.0%). They were mostly women (13, 52%) and married (14, 56%). Among these patients, 20 (80%) lived with a family member, either children, spouse or grandchildren. Fourteen (56%) employed a domestic helper in the home, and four (16%) participants had a paid caregiver to support their personal care needs. In terms of mobility prior to admission, eight (32%) were independent with their mobility and did not require any aids, nine (36%) required walking aids with the remainder either bed or wheelchair bound. In terms of daily activity performance, nine patients (36%) were independent in both basic and complex activities, while seven (28%) required assistance with basic daily tasks, and another seven (28%) needed complete assistance. Only two (8%) were able to only perform basic daily activities independently.

Among the 120 respondents (participants who were patients and able to respond to the questions, and the caregivers of patients who were unable to participate), the majority would consider the VW as an alternative to inpatient care. 51 (42.5%) would definitely accept the service, 57 (47.5%) accept, six participants were unsure, 4 (3.3%) would not, and 2 (1.7%) definitely would not. When separated, 85/95 (89.5%) self-reporting participants, and 23/25 (92.0%) caregivers would accept such a service. The reasons for accepting or declining the VW service are summarised in Figure 1.

Regarding perceptions of telehealth use, 114 (95%) of participants had internet access and 117 (97.5%) possessed appropriate devices for video consultation. However, only 24 (20%) participants have had experience receiving medical assessment over online video consultations. 38 (31.7%) participants have utilised some form of wearable technology

to monitor health. In terms of caregivers, only nine (36%) have used online video consultation to obtain medical advice. In terms of participants' confidence in using technology to access healthcare, participants reported higher confidence in using technology to access healthcare, with 76 (63.3%) rating their confidence as "adequate" or "a lot", compared to 13 (52.0%) of caregivers.

DISCUSSION

This study demonstrated a high acceptability rate of 90% among surveyed participants to consider being managed under a VW service. Many participants displayed sufficient telehealth knowledge and had access to the necessary digital infrastructure, suggesting that VWs have the potential to support ongoing patient care. This potentially reduces the demand for hospital inpatient care. Several factors likely contributed to this high acceptance rate. Participants expressed a strong preference to remain at home when clinically appropriate, with their care and recovery supported by family members. They reported that this would better facilitate their recovery and preserve their independence.

Several factors from this survey may explain the high acceptance rates. Many respondents were relatively younger, and possibly more technology literate to be receptive to digital health solutions.^{8,10} Participants also reported high rates of internet access and device ownership which could influence the acceptance of VW services. Additionally, most participants already have support at home to enable care. The high acceptance was also reported by caregivers. Although this study was not designed to explore the reason behind this, it is plausible that the high acceptance can be contextualised by strong sociocultural norms around family involvement in care, including multigenerational cohabitation and expectations of filial caregiving.¹¹ These family-centred structures may enhance acceptability of home-based care which fits with the preference to avoid or minimise hospitalisation.

Being at home may also facilitate recovery, as evidenced in existing literature. Levine et al., demonstrated in a randomised controlled trial that patients managed at home had significantly lower 30-day readmission rate compared to their controls (7% vs. 23%).³ Similarly, studies conducted during the COVID-19 pandemic by Ward et al. and Grutters et al., highlighted the safety and efficacy of VW.^{12,13} These investigations on home telemonitoring for COVID-19 patients reported low readmission rates of 3% and 9%, respectively, with Ward et al., noting a 1% mortality.¹² Collectively, these findings support the potential of VW to ensure patient recovery in managing acute illness outside traditional hospital environments. VW provides the opportunity to maintain a level of independence while still receiving necessary medical oversight. Hospitalised patients often experience prolonged sedentary periods, with studies showing that 90% of their hospital stays are spent in low-activity states, which can lead to decreased mobility and greater dependency post-discharge.^{14,15} Familiar home environments have a profound impact on sleep and appetite, which are both vital to ensure recovery.¹⁶ This context highlighted the psychological and physical benefits of VWs.

VWs offer the opportunity to extend hospital-level care into patient's homes, while reducing the likelihood of hospital-acquired infections, falls and fostering more personalised patient-centred care. Findings from this survey provide an important baseline for future targeted studies aimed at better understanding specific factors which may influence VW acceptance among patients and caregivers in similar healthcare systems and region. Studies across various countries, including the United Kingdom, United States, Australia, Canada, and Singapore have similarly demonstrated the possible reasons of acceptance of virtual is due to their immense benefits such as increased convenience, reduced travel time, cost, and earlier discharge time, indicating the potential of VWs to improve healthcare delivery in diverse healthcare system.^{8,17-20} Studies by both Heller et al. and Coloma et al. supports this potential, showed that shifting dependency on hospital-centric care models can rapidly expand bed capacity and reduce nosocomial infection risks.^{21,22} Key reasons for acceptance were reported in a study by Lai et al. in Singapore which surveyed hospitalised patients (mean age 53.5, SD 15.3) showed a 72.5% acceptance rate for such a service.⁸ The primary reasons for acceptance included comfort at home, the presence of family members, and confidence in remote monitoring systems. Another pilot study during the COVID-19 pandemic demonstrated high acceptance of virtual consultations adult caregivers, though it focused on older outpatients, which limits direct comparison to our inpatient sample.⁹ Acceptance was particularly high among those with electronic devices, living companions, or familiarity with virtual platforms which mirrors findings from this survey.

Despite the high overall acceptance of VWs identified in this study, only one-in-five of participants have experience with online video consultations for healthcare purposes, and just under one-third have used wearable health-monitoring devices. Over one-third of caregivers had accessed medical advice via video consultation. This low baseline digital health engagement may represent an important barrier to VW implementation and scalability, underscoring the need for targeted digital literacy support, caregiver training, and system-level facilitation to support future implementation.

This study has several limitations. It consisted of relatively young respondents, which may not accurately reflect the broader age distribution of hospitalised patients. Older adults may face challenges completing this survey independently, and not all have a caregiver available to respond on their behalf. Many VW or hospital-at-home services in published literature have been designed to meet the needs of older adults.² However, this should not exclude the views of younger individuals. While they may not represent those with the highest healthcare needs, their perspectives remain relevant, as they are also likely to benefit from VW services. This use of convenience sampling introduces potential sampling and reporting biases. Nearly 30% of approached patients declined participation, which may have skewed results if these individuals were less inclined to accept VW services. Besides that, this hospital served an urban catchment area which limits how a VW service would be accepted in other areas. This study was unable to identify any demographic or socioeconomic factors that might influence

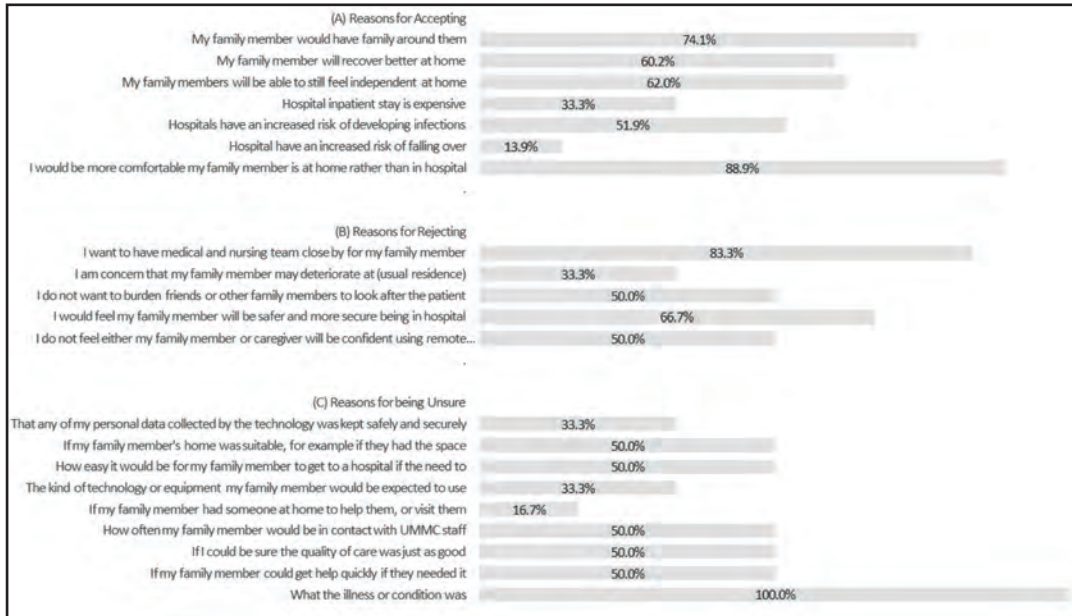
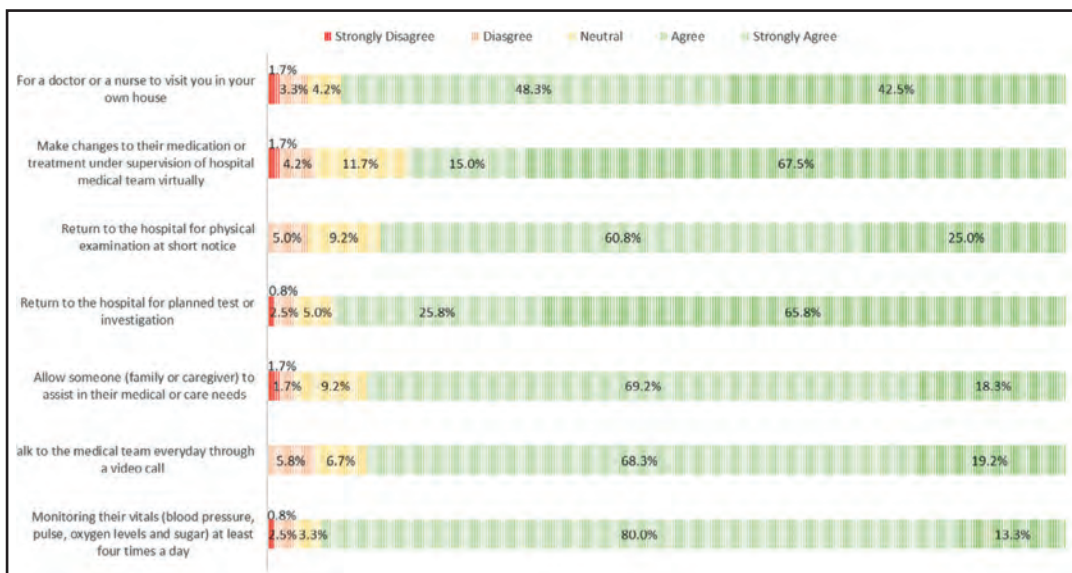


Fig. 1: Reasons for (A) Accepting, (B) Rejecting, and (C) Unsure of the virtual ward service



Participants expressed their willingness to accept individual components offered by a VW service (Figure 2).
 Fig. 2: Acceptance of individual components within a virtual ward service

VW acceptance. The quantitative nature of the survey with its limited range of answer choices was unable to fully explore patients' reasons for accepting or declining VWs. Therefore, these limitations do affect the results and ultimate generalisability of this study's findings. The study sample would have systemic differences with the general population that VW services would target. Despite these limitations, the findings from this study provided valuable insight into the community's acceptance of VW services in Malaysia.

Several recommendations for future studies on VW acceptance. A broader age demographic and clinical needs

will provide a more representative understanding of acceptance across age groups particularly among those with the highest healthcare needs. To reduce sampling and reporting biases, future studies could adopt stratified sampling methods across different settings to increase representativeness and reduce biases. Future surveys could include more comprehensive and detailed questions to explore motivations and barriers, with open-ended questions allowing for better insights. Long term studies might be helpful to understand how acceptance and usage of VWs evolve over time, especially in relation to patient satisfaction, health outcomes and cost effectiveness.

CONCLUSION

This study is the first to assess patient and caregiver acceptance of VW services in Malaysia, demonstrating a high acceptability rate. This readiness stems from a relatively younger, digitally enabled demographic and a cultural preference for family-supported home care. Despite its limitations, the study underscores the promise of VWs as a mainstream healthcare model. Moving forward, sustainable funding and targeted outreach are crucial to broaden access, while future research should explore acceptance across diverse demographics to support the scalability of VWs in Malaysia. Adopting this model could play a vital role in the evolution of accessible, efficient healthcare.

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