

Heart Failure Virtual Consultation: bridging the gap of heart failure care in the community - A mixed-methods evaluation

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Abstract

Aims We undertook a mixed-methods evaluation of a Web-based conferencing service (virtual consult) between general practitioners (GPs) and cardiologists in managing patients with heart failure in the community to determine its effect on use of specialist heart failure services and acceptability to GPs.

Methods and results All cases from June 2015 to October 2016 were recorded using a standardized recording template, which recorded patient demographics, medical history, medications, and outcome of the virtual consult for each case. Quantitative surveys and qualitative interviewing of 17 participating GPs were also undertaken. During this time, 142 cases were discussed—68 relating to a new diagnosis of heart failure, 53 relating to emerging deterioration in a known heart failure patient, and 21 relating to therapeutic issues. Only 17% required review in outpatient department following the virtual consultation. GPs reported increased confidence in heart failure management, a broadening of their knowledge base, and a perception of overall better patient outcomes.

Conclusions These data from an initial experience with Heart Failure Virtual Consultation present a very positive impact of this strategy on the provision of heart failure care in the community and acceptability to users. Further research on the implementation and expansion of this strategy is warranted.

Keywords Primary care; Integrated care; eHealth; Heart failure

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Introduction

Many challenges remain in the management of heart failure (HF) with suboptimal implementation of guideline-recommended therapies, a changing profile of patients who are older and have multiple co-morbidities, and a high rate of early re-hospitalization for HF.¹ Overall, the management of HF remains fragmented, and concerted action by all professionals concerned is needed. In particular, there is a lack of cohesive interaction between primary care, where HF care should be centred and co-morbidities managed, and specialist cardiologist input for advice and involvement on aspects of management at critical phases of the life cycle of an HF patient.

In the early 2000's, publications suggested that only a third of those with a clinical diagnosis of HF had echocardiography or further referral,² and this has not changed significantly in a more recent study.³ A publication this year from the Netherlands⁴ showed that 31% of the confirmed HF patient cohort of 434 people were managed solely within the primary care structure as defined by no cardiology contact with the patient within an 18-month period.

This lack of effective interaction leads to inaccurate delayed diagnosis, suboptimal management including self-care, increasing likelihood of poor outcomes.

Use of modern communications systems has the potential to revolutionize primary care–secondary care interactions.

Online, real-time consultations between the general practitioner (GP) and the specialist can provide speedy, focused interaction on specific issues of care, often circumventing the need for patient travel. In addition, the capacity to allow multiple users observe and participate in each consultation enables knowledge dissemination. Similar initiatives in other disease areas have had impressive results on disease management.⁵ This study focusing on hepatitis C management showed that patients with hepatitis C infection can be managed as effectively in primary care using an online Web conferencing model between GPs and hepatologists as patients attending an academic medical centre in terms of sustained virological response to therapy.

We have recently deployed a GP specialist online, real-time interaction to discuss patient's problems in HF. This application, which we refer to as 'Virtual Consultation', can host at one sitting up to 25 GP practices, enabling specific case discussion and also a dissemination of practical tips in HF care. This strategy offers an alternative to standard clinic assessment, can provide the GP with all the information that he or she requires, can reduce need for onward direct referral and thereby can reduce 'unnecessary' travel for the patient and family, a very meaningful bonus for this type of interaction given the age and frailty of many patients with HF. This intervention also provides a user-friendly method to update the care strategy for a patient without necessarily requiring the patient to travel.

The patient-specific aspect of the service is complimented with a brief continuing medical education (CME) session at the beginning of each clinic on practical issues related to HF care.

This study was a prospective observational study of the cases referred to this service between June 2015 and October 2016 along with a qualitative and quantitative study of GP perceptions of the service and possibilities for further development.

Methods

The Heart Failure Virtual Consultation service

The Heart Failure Virtual Consultation (HFVC) was established in the St Vincent's Heart Failure Unit in January 2015.

The HFVC runs fortnightly, and GPs receive an invitation approximately 10 days prior to each session. The invitation provides information on the date of the session, the education topic to be covered that week and a request to send in a case where diagnostic or therapeutic advice is needed. A GP may send in a case or may simply sign in to hear/contribute to other GP cases being discussed. For those who wish to have a case discussed, the GP completes a referral form and returns it to the HFVC team by fax or secure e-mail with patient details anonymized. The HFVC team then

prepares the case, outlining the patient's clinical history and the clinical question(s) for presentation on slides during the HFVC.

The HFVC session begins with the HF specialist providing a 10 min didactic education session during which GPs can ask questions. Following the education session, cases are discussed sequentially. The GP to whom the case applies discusses the case at the outset, and slides outlining anonymized patient data are viewable by all participants. Other GPs may also contribute to the discussion, creating a dynamic learning environment. At the end of each case, a management plan is agreed on, and a letter outlining this was returned to the referring GP.

Analysis

Clinical review

All cases from June 2015 to October 2016 were recorded using a standardized recording template, which recorded patient demographics, medical history, medications, and outcome of the HFVC for each case. Cases were categorized as relating to potential new diagnosis of HF, therapeutic questions in an established case of HF or issues related to emerging HF deterioration.

General practitioner user satisfaction with the Heart Failure Virtual Consultation clinic

This was assessed using a mixed-methods approach, combining quantitative surveys and qualitative interviewing. A total of 30 GP practices utilized the service during the study. A number of GPs may be involved in single GP practice, and it is not possible to determine how many individual GPs in each practice have been involved. Seventeen GPs who had participated in the HFVC, all from different practices, responded to invitations to participate in this study. Survey data were collected using Likert-scale statements that participants rated from 1 (strongly disagree) to 5 (strongly agree), and participants were then asked to participate in qualitative interviews also. The qualitative interviews explored the topics covered in the survey in more depth and provided the participant with an opportunity to add any additional information and make recommendations arising out of their experiences. The average duration of the interviews was 35 min. Interviews were conducted through face-to-face meetings and over the telephone.

Metrics of patient convenience

Two metrics of patient convenience were noted: (i) need for subsequent use of standard outpatient service and or emergency department (ED) for an HF-related issue despite the use of the HFVC and (ii) kilometres of travel saved as a result of not requiring standard clinic review based on distance from the GP practice to St Vincent's Heart Failure Unit. This was calculated for all patients not requiring a traditional outpatient review in the clinic, as it was assumed

that otherwise these patients would have travelled to the clinic for an outpatient appointment for specialist review.

Statistical analysis

Descriptive statistics were applied to the data using GraphPad Prism 6 (GraphPad Software, Inc., La Jolla, CA, USA).

Results

Nature of case, agreed intervention and outcome

Between June 2015 and October 2016, 142 cases were discussed at the HFVC. The demographics of the patients are presented in *Table 1*. New diagnostic cases and emerging deterioration cases are equally distributed between male and female cases, with the therapeutic cases being predominantly female. The median ages are similar between the groups ranged from 74 to 79.5 years. A high incidence of ischaemic heart disease in emerging deterioration cases is noted. This likely reflects the burden of decompensation risk in both HF types (i.e. reduced ejection fraction and preserved ejection fraction) in those with a prior diagnosis of ischaemic heart disease.

The nature of the cases discussed and outcomes is highlighted in *Table 1* and *Figure 1* along with the agreed

intervention. The diagnostic cases required more interventions after the HFVC compared with the emerging deterioration and therapeutic cases. In the new diagnostic category, the interventions mostly related to the need for a repeat HFVC to discuss results of investigation such as echocardiography and form a therapeutic plan, therapeutic changes, NP testing, and referral for echocardiography to confirm HF sub-types. In the emerging deterioration category, therapeutic changes were most common, followed by natriuretic peptide (NP) testing and, if need be, repeat HFVC.

The outcome for the new diagnostic case is described in *Table 2*. The ratio of HF, not HF, and indeterminate HF diagnosed on first consultation is almost equal to that after the HFVC. The indeterminate HF cases were arranged for follow-up tests and review with the HFVC.

Overall, 17% of cases required review in person by an HF specialist following the HFVC.

Usability

A total of 30 GP practices utilized the service during the study. Seventeen GPs who had participated in the HFVC, all from different practices, responded to invitations to participate in this study.

Of the 17 GPs who have signed into the HFVC, nine used the service one to five times; six, six to 12 times; and two, 13–20 times.

Table 1 Demographics

	New diagnostic case <i>n</i> = 68	Emerging deterioration case <i>n</i> = 53	Therapeutic case <i>n</i> = 21
Gender (<i>n</i> , %)			
Male	33 (48.5)	23 (43.4)	5 (23.8)
Female	35 (51.5)	30 (56.6)	16 (76.2)
Age, years (med [IQR])	78.5 [70.8:94]	79.5 [73:83]	74 [69.5:79]
Risk factors and co-morbidity (<i>n</i> , %)			
Hypertension	33 (48.5)	22 (41.5)	14 (66.7)
Atrial fibrillation	24 (35.3)	20 (37.7)	7 (33.3)
Ischaemic heart disease	11 (16.2)	23 (43.4)	11 (52.4)
Valve disorder	4 (5.9)	1 (1.9)	1 (4.8)
Diabetes mellitus	18 (26.5)	9 (16.9)	20 (95.2)
Lipid disorder	10 (14.7)	9 (16.9)	8 (38.1)
Chronic obstructive pulmonary disease	7 (10.2)	10 (18.9)	2 (9.5)
Renal impairment	10 (14.7)	15 (28.3)	4 (19.0)
Anaemia	0 (0)	9 (16.9)	1 (4.8)
Depression	4 (5.9)	6 (11.3)	1 (4.8)
Medication (<i>n</i> , %)			
ACE-I/ARB	38 (55.9)	29 (54.7)	14 (66.7)
Beta-blocker	33 (48.5)	33 (67.9)	17 (81.0)
MRA/AA	0 (0)	5 (9.4)	1 (4.8)
Diuretic	42 (61.8)	39 (73.6)	10 (47.6)
Oral anticoagulant	14 (20.6)	15 (28.3)	6 (28.6)
Ivabradine	1 (1.5)	0 (0)	0 (0)
Digoxin	7 (10.3)	8 (15.1)	4 (19)
Statin	33 (48.5)	29 (54.7)	18 (85.7)
Nitrate	1 (1.5)	6 (11.3)	2 (9.5)

AA, Aldosterone antagonist; ACE-I, ACE inhibitor; ARB, Angiotensin Receptor Blocker; IQR, Interquartile range; MRA, Mineralocorticoid Receptor Antagonist.

Figure 1 Outcome of Heart Failure Virtual Consultation (HFVC). DCCV, direct current cardioversion.

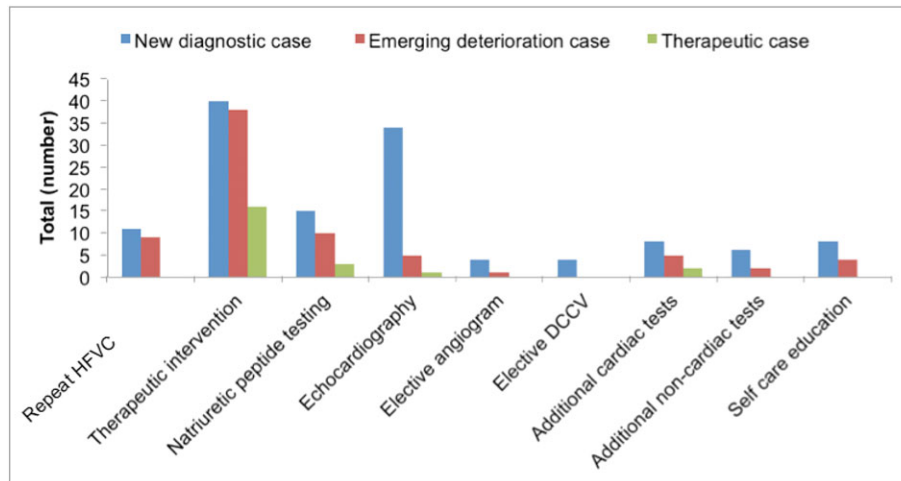


Table 2 Outcome of new diagnostic case

<i>n</i> = 68	Confirm HF	Not HF	Indeterminate HF
Outcome (<i>n</i> , %)	24 (35.3)	25 (36.8)	19 (27.9)

HF, heart failure.

The majority of participants rated the technology statements positively with a mean rating of 4.00 to 4.47 (Table 3). However, a limited number of participants reported issues related to insufficient information being provided prior to participating, difficulty in terms of signing in and dissatisfaction with the technology generally. This cohort discussed a need for information technology support to address technical issues when they arose.

On the second occasion I couldn't get a connection and there didn't seem to be anybody to talk me through it or get me out of the predicament I was

in I could hear what was going on but I couldn't see anything ... I couldn't see the details of the case so I didn't know what they were talking about ... even somebody that I could have telephoned at the start of the meeting ... usually it's something I have done. (GPU003)

Furthermore, during the interview phase of the study, a number of participants discussed a need for a comprehensive video guide on how to download the software, how to use the software, best positioning for the technology, and how to participate (procedure).

Another technology concern raised during the interviewing phase of the study was data protection and a perceived lack of information surrounding security issues. For example, one participant discussed being unsure of whether there was an encryption of the information and whether their discussion was being recorded and had the potential to be

Table 3 General practitioner experience of using the virtual clinic (*n* = 17)

	Strongly agree (%)	Agree (%)	Neither agree nor disagree (%)	Disagree (%)	Strongly disagree (%)	Mean (SD)
I feel I was provided with sufficient information prior to participation in the clinic	59	29	6	6	0	4.41 (0.71)
I found signing into the clinic easy	35	41	12	12	0	4.00 (1.0)
I found participating in the clinic easy	53	35	12	6	6	4.00 (1.2)
I have been satisfied with the technology such as the software	41	35	12	6	6	4.00 (1.2)
The technology for the clinic functions smoothly	35	29	17	6	6	4.18 (0.73)
The referral form allows me to record all the information I need to adequately discuss my case	30	47	24	0	0	4.06 (0.75)
I am satisfied that I receive adequate support when I present a case to the clinic	36	47	18	0	0	4.18 (0.73)

taken out of context at a later point in time. These issues are easily remedied through the provision of more in-depth information packs when a GP is being invited to participate and the setting up of an information technology support system.

In terms of usability, the majority of GPs felt confident enough to engage with such technology and discussed the model in terms of ease of set-up engagement. As such, findings do not suggest that technology is a barrier to participation.

Self-reported efficacy

This study also explored whether GPs felt they experienced any benefits to their professional development through participation with the HFVC. The majority of participants either strongly agreed or agreed with statements related to increased confidence, broadening of their knowledge base, and better patient outcomes, with mean ratings ranging from 4.35 to 4.47 (Table 4).

During the interview phase of the study, GPs reported engagement with the HFVC as having positive impacts upon referring patients to secondary and tertiary care, whereby all participants reported reducing referrals as a result of having increased knowledge and confidence to manage a cohort of HF patients in the community.

I have learned more about the more appropriate treatments and I have been able to use that on other patients. My own personal knowledge of heart failure has improved. ... it's [HFVC] got the ability to improve the diagnosis and therefore improve treatment at an earlier stage and they get managed better and better care at primary care. Then their referral on the secondary and tertiary care is delayed. (GPU007)

It's [HFVC] given me a confidence level, I mean I can't remember the last time that I sent someone in. I mean I kind of know, at this stage, most of the tricks. (GPU011)

When asked during interview how patients reacted when informed that their case was being discussed at the HFVC, all participants agreed that patients were very pleased with the model, were happy to have their condition discussed with experts and a group of GPs and were relieved at not being referred to the outpatient department:

Always [tell the patient that the case will be discussed], they are very happy—I tell them that I am going to talk to an expert in heart failure and you won't have to go along yourself. Usually they are older patients and hate the idea of going to

Table 4 General practitioner reports of benefits related to participation with the virtual clinic ($n = 17$)

	Strongly agree (%)	Agree (%)	Neither agree nor disagree (%)	Disagree (%)	Strongly disagree (%)	Mean (SD)
Participation in the clinics has improved my confidence in identifying HF	29	47	18	0	0	4.41 (1.37)
Participation in the clinic improved my ability to care for patients with HF	41	53	6	0	0	4.36 (0.61)
I feel I learn best practice in HF through my participation in HF virtual clinic	41	53	6	0	0	4.36 (0.61)
I am able to connect with my peers and colleagues through participation in the clinic	35	53	12	0	0	4.42 (0.66)
Discussions with other participants of the clinic enhanced my knowledge of HF	41	53	6	0	0	4.36 (0.61)
Case-based learning increased my knowledge about HF	41	59	0	0	0	4.41 (0.51)
The didactic presentation enhanced my knowledge about HF	41	53	6	0	0	4.24 (0.83)
I find the advice I get from the clinic is useful when treating my patients in surgery	47	53	0	0	0	4.47 (0.51)
I feel my patients have benefited as a result of my participation in the clinic	47	53	0	0	0	4.47 (0.51)

HF, heart failure.

outpatients and I can go present all their results and information to the clinic and they are very pleased with it. No-one has ever said to me that they are unhappy with it or complained. (GPU010)

Participants were also asked whether, in their experience, participation with the HFVC had reduced the number of HF referrals made to the secondary/tertiary care system. The majority of participants either strongly agreed or agreed that the HFVC had facilitated keeping a cohort of patients, who would likely otherwise have been referred, in the primary care setting (*Table 4*).

Metrics of patient convenience

None of the patients with emerging deterioration required referral to the ED or hospital admission. Thirty-six cases had a repeat HFVC discussion. The total distance travel saved from all cases to date has been 10 552 km.

Discussion

This study shows the benefits of the HFVC from both health system and health professional perspectives. The HFVC can adequately and safely deal with the many of the queries that otherwise would have required outpatient department attendance. GPs also reported increased confidence in HF management, a broadening of their knowledge base, and a perception of overall better patient outcomes. Finally, in safely managing many issues by this method, the inconvenience of travel for the patient and his or her family has been avoided.

Heart failure has become an increasingly complex condition with difficulties in diagnosis, often reflecting the attendant co-morbidities, complex diagnostics required to fully understand aetiology, and a wide variety of pharmacological and non-pharmacological therapeutic strategies.⁶ It has been shown that given the complexity of HF, there is an understandable lack of confidence in many of the aspects of HF care among GPs.⁷ Therefore, it is important to ensure that specialist opinion is readily available particularly as it is proposed that more patients can be discharged from specialist clinics to community settings.^{8,9} Present communication paths, predominantly offline, and often by referral letter necessitating an outpatient review do not allow easy communication between professionals and can lead to disjointed care. For example, one study demonstrated that HF patients reported too many medications and appointments, barriers to accessing services, fragmented and poorly organized care, lack of continuity, and inadequate communication between health professionals as components to treatment burden that they experienced.¹⁰

Optimal and timely communication between GPs and cardiologists can help ensure that appropriate care is provided and reduce many of these elements of treatment burden. A previous study indicated that virtual primary care consultations with cardiologists can reduce ED visits. This study used asynchronous electronic consultations and found that this service could resolve about two-thirds of cardiac concerns without a specialist visit and reduced cardiac related ED visits during the 6 month follow-up period.¹¹ The use of a structured service such as the HFVC allows timely communication and addresses certain limitations of phone calls or unstructured emails such as incomplete data and lack of documentation of the interaction. It also preserves the advantages of such interactions such as a timely response, case-based education, building of relationships between GPs and specialists, identification of cases that require formal consultation, and the patient convenience and cost savings associated with avoiding an in-person visit.

Accessible and relevant education for GPs and access to specialist opinion is essential if they are to be enabled to provide high quality care in a rapidly evolving healthcare environment. This is particularly challenging within a community context as GPs may work in isolated settings, with varied access to educational opportunities and peer review of practice. New or innovative approaches employing eHealth strategies pose a potential solution to these issues, but most studies of telemedicine are methodologically weak and often focus on feasibility and acceptability to patients rather than discrete clinical outcomes such as mortality or hospitalizations.¹² There may also be unintended consequences. For example, even if a virtual consult is more efficient than a face-to-face encounter, if it leads to more encounters overall, healthcare costs will increase. One study found that follow-up visits increased particularly in specialties that required specialized examination techniques such as ENT and orthopaedics.¹³ However, HF is a condition that is particularly suited to this model as modalities such as echocardiography can now be provided in the community and interpreted remotely.

While our initial experience has been positive, it is clear that the use of HFVC requires refinement. Ensuring that the technology is both appropriate and secure is vital and brings a new member to the multidisciplinary team in HF—the information technology specialist. It is possible that providing education initiatives in the manner outlined might increase referral through GPs becoming aware of some aspects of care previously not known, and this was not explicitly evaluated in this study. The study had a relatively small sample size, so broad conclusions cannot be drawn, and indeed, a randomized controlled trial of this methodology is warranted to determine its effect on clinical and patient reported outcomes. Patients' experience was not assessed and is also an area for future exploration. Overall, however, the use of this mixed-methods approach provides valuable data on the

development and use of this service, its potential, and areas requiring further exploration.

Conclusions

These data from an initial experience with HFVC present the positive impact of this strategy on the provision of HF care in the community and acceptability to users. In addition, it is likely that this strategy will have benefits in the management of other chronic illnesses, and therefore, increased focus on and resourcing of such efforts may have a significant impact on the development of chronic disease strategies in the future. Further research on this strategy focusing on patient outcomes and acceptability, implementation science approaches, and economic evaluations is required.

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Conflict of interest

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