Feasibility Assessment for Implementation of Heart Failure Clinical Caremaps using Electronic Medical Records in Primary Practice

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ABSTRACT

Objectives: The primary aim of this project is to evaluate the impact and level of use of Electronic Medical Records (EMRs) by family physicians (FPs) specifically with respect to heart failure (HF) management. This study provides pilot work towards successful implementation of HF clinical caremaps in EMRs to support decision making for FPs.

Methods: A survey questionnaire was sent to 207 FPs from which 42 (20%) replies were received. The survey included questions on demographic information of the FP's practice, specifics about HF patients and their management, EMR use and whether they have improved management in HF patients.

Results: Among the 42 FPs who responded, 39 (93%) practice in the urban area of Hamilton and each have over 10 confirmed HF patients at their family practices, supporting the need for proper management of HF at the primary care level. FPs expressed concerns about difficulty in treating HF preserved versus systolic HF, in managing HF patients with renal insufficiency and difficulty in the use of beta-blockers. There was no consensus on whether EMRs have helped in improving the management of HF patients.

Conclusions: There is a perceived need for management tools that can be integrated into EMRs to provide decision-making support for FPs in managing HF. Tools such as caremaps may help provide optimal care in managing HF patients as per the Canadian Cardiovascular Society guidelines.

RÉSUMÉ

Objectifs: L'objectif principal de ce projet consiste à évaluer l'utilisation des dossiers médicaux électroniques (DME) par les médecins de famille et ses répercussions sur leur pratique, tout particulièrement dans la prise en charge des cas d'insuffisance cardiaque (IC). L'étude est un projet pilote visant la mise en œuvre réussie de cartes de soins cliniques pour l'IC dans les DME afin d'appuyer la prise de décisions des médecins de famille.

Méthode: Un sondage a été envoyé à 207 médecins de famille, dont 42 (20 %) ont répondu. Le sondage comprenait des questions sur les données démographiques relatives à la pratique du médecin de famille, sur les données particulières relatives aux patients souffrant d'IC et leur prise en charge, et sur l'utilisation des DME. Le sondage demandait également si l'utilisation des DME améliorait la prise en charge des patients souffrant d'IC.

Résultats: Des 42 médecins de famille qui ont répondu au sondage, 39 (93 %) pratiquent dans la région urbaine de Hamilton et chacun a 10 patients atteints d'IC confirmés, ce qui appuie le besoin d'une prise en charge adéquate de l'IC dans les services de santé primaires. Les médecins de famille ont exprimé des préoccupations relativement aux difficultés rencontrées pour soigner les personnes atteintes d'insuffisance cardiaque, à la prise en charge de l'IC à fonction systolique préservée par opposition à l'IC systolique, à la prise en charge des patients qui ont une IC s'accompagnant d'insuffisance rénale et qui ont de la difficulté à prendre des bêtabloquants. Il n'y avait pas de consensus si les DME avaient aidé à améliorer la prise en charge des patients atteints d'IC.

Conclusions: Un besoin est perçu pour des outils de prise en charge qui pourraient être intégrés aux DME afin d'appuyer la prise de décisions des médecins de famille dans la gestion des cas d'IC. Des outils tels que des cartes de soins pourraient aider à fournir des soins optimaux dans le cadre de la prise en charge des patients atteints d'IC selon les lignes directrices de la Société canadienne de cardiologie.

INTRODUCTION

It is estimated that heart failure (HF) affects over 500,000 Canadians, and 50,000 new patients are diagnosed each year, contributing to significant mortality and health-care costs [1-4]. Most community-dwelling HF patients in Canada are under the care of family physicians (FPs) [5]. Current evidence-based treatments for HF management are often not fully implemented in clinical practice [6-9]. The Congestive Heart Failure Assessment and Management in Primary Care (CHAMP-C) study was conducted to assess the effectiveness of HF clinical caremaps (a treatment algorithm based on evidence based guidelines - see Figure 1) designed to optimize the use of angiotensin converting

Keywords: electronic medical records, heart failure; family practice/general practice/primary care

enzyme inhibitors (ACE-I), angiotensin receptor blockers (ARB) and beta-blockers in primary care [10]. This study was a cluster-randomized control trial where 53 FPs were randomized to intervention or control group (n = 176 HF patients, mean age: 78, standard deviation: 7). This was a six-month intervention where FPs implemented clinical caremaps based on Canadian Cardiovascular Society (CCS) HF guidelines with the support of a specialized HF nurse [11].

One important finding of the study was that clinical caremaps are most effectively used if primary care practitioners are receiving regular prompts by a HF specialized nurse clinician. Hence, a method is required to improve the prescription of HF therapy in a larger number of family practices using ongoing and timely prompts. This led to the consideration of transforming these paper-based caremaps into an electronic format and implementing them into an electronic medical record (EMR) platform which FPs commonly use. Before implementing these caremaps into EMRs, it is critical to obtain objective evidence for the use of EMRs by FPs for the management of HF.

EMRs provide many advantages over paper based health records including auto population of patient data forms, decreased need for space for physical paper records, automation of many procedures with reduction in errors, e-prescribing and clinical documentation capabilities which may lead to enhanced patient workflow and increased productivity.

Most outpatient electronic modules available to FPs have been developed for the management of other chronic conditions such as diabetes mellitus and hypertension [12-15]. The "Smart" HF Sheet was developed as an EMR based clinical decision-making tool to assist physicians in the outpatient setting, and it provides alerts based on class Ia recommendations of the American Heart Association [16]. However, there is little data on its use and impact on the adoption of HF guidelines in the community. The current tools available to FPs for HF management are quite limited and primarily involve stand-alone paper based/pdf methods. These include the Canadian Cardiovascular Society guidelines [3], and American Heart Association Heart Failure Pathways/Algorithms [17]. The National Institute for Health and Care Excellence (NICE) chronic heart failure pathways [18] offer interactive online modules that can help guide physicians through various steps of the management process but are stand-alone and cannot be incorporated as part of an EMR.

This project provides necessary pilot work towards successful implementation of HF caremaps in EMRs. However, the primary aim of this project and the first step to this successful implementation was to evaluate the level of use and impact of EMRs in the Family Medicine Association of Hamilton (FMAH), Ontario. This project assessed the current level of EMR use, po-

tential future use of EMR, and the advantages/disadvantages of EMRs particularly with respect to managing HF. In addition, it provided information on potential difficulties FPs face on a daily basis in managing HF patients.

METHODS

A survey was sent to 207 FPs within the FMAH. Out of these, 42 (20%) FPs replied. The FPs were reached through an anonymous e-mail list provided by the FMAH. The survey (see Appendix: FP Survey [online at uojm.ca]) was designed specifically for the purposes of this study and has not been validated or pilot tested before. The survey was sent via e-mail as a fillable PDF form and could be returned via e-mail, or printed and faxed. The survey was sent twice during the months of October and November, 2010 to increase response rate. The information received was removed of any identifiers during data retrieval. The McMaster University Faculty of Health Sciences Research Ethics Board approved this project.

The survey included questions regarding demographic characteristics of FP practices including method of payment, whether it is a group practice, and estimated number of total patients per FP. There were more HF specific questions including estimated number of HF patients, use of CCS guidelines, and the most common problems FPs face in manage in HF patients. The subsequent questions were related to EMR use and whether the use of EMRs has improved management of HF patients.

RESULTS

Results are summarized in Tables 1 to 3. Table 1 shows that the large majority of FPs (n=39, 93%) practice in an urban area. 96% (n=40) of FPs have over 1000 enrolled patients and 79% (n= 33) FPs manage over 10 confirmed HF patients in their practice. Table 2 shows that the majority of FPs expressed some difficulty in treating HF preserved versus systolic (n=27, 64%); difficulty in use of beta-blockers (n=22, 52%), and difficulty in treating HF with renal insufficiency (n=26, 52%). 64% (n=27) of the FPs were aware of the CCS guidelines but 74% (n=31) did not utilize these guidelines in their daily practice. In terms of EMR use (see Table 3), the large majority of FPs (n=30, 71%) in our study were using EMRs in their clinical practice. Out of the FPs surveyed who did not currently use an EMR, four were planning to adopt EMRs within the next year. 57% (n= 17) of the FPs had been using EMRs for 5 years or less. The most common barriers to adopting EMR were time commitment towards learning to use EMRs (n=6, 50%), followed by technical barriers (n=3, 25%) and lack of interest (n=3, 25%). There was no consensus in our study on whether EMRs currently have helped in improving the management of HF patients, with only 43% (n= 13) of responses stating that they have helped.

Table 1: Demographic Characteristics for Family Physician (N=42)

	n	%
Large Urban Area >300,000 population	39	93
No fee for service	35	83
Capitated Billing Method	20	48
Family Health Group	11	26
Other	4	9
Group Practice 2 FP or more	30	71
1000 - 1500 patients/practice	17	41
>1500 patients/practice	23	55
10-40 HF patients/practice	26	62
>40 HF patients/practice	7	17
>5 HF patients in long-term care facility	8	19

HF: Heart Failure; FP: Family Physician

Table 2: Heart Failure Management (N=42)

	n	%
Difficulty in treating HF preserved vs. systolic HF	27	64
Difficulty in treating HF with renal insufficiency	26	62
Difficulty in use of beta-blockers	22	52
Difficulty in uptitration of beta-blockers	16	38
Difficulty in titrating/adjusting diuretics	20	48
Aware of the CCS guidelines	27	64
Have not read the latest 2009 or 2010 CCS updates	28	67
Do not use the CCS guidelines in their daily family practice	31	74
Do not use MOHLTC HF management incentive?	34	81
MOHLTC HF management incentive has affected management of HF patients?	8	19

HF: Heart Failure; CCS: Canadian Cardiovascular Society; MOHLTC: Ministry of Health and Long-Term Care

Table 3: Electronic Medical Records (N = 42)

	n	%
Clinical practice uses EMR	30	71
EMR used - Practice Solutions	18	60
EMR used - OSCAR	5	17
EMR used - P & P	3	10
Used EMR < 5 years	17	57*
Used EMR 5-10 years	8	27*
Used EMR > 10 years	5	17*
Use of EMR has improved management of HF patients	13	43

EMR: Electronic Medical Records; OSCAR: Open Source Clinical Application and Resource; P & P: P & P Data Systems

*The combined percentage is greater than 100% due to round

DISCUSSION

Our results show that many HF patients are managed at the primary care level by the FP. This is in accordance with the previous data presented by Boom et al [8]. This study was conducted in Ontario, Canada and includes 7,634 newly hospitalized HF patients of which 64% were managed by generalist alone, 20% by cardiologist alone, and 16% received consultative care. Ahmed et al. performed a study in Alabama, USA which showed that of 1075 patients, 55% received care from generalist alone, 13% from cardiologist alone and 32% received consultative care [7].

Our results demonstrate that there is a need for tools to help manage complex HF patients at the primary care level. More than half the family physicians surveyed expressed difficulty in treating HF preserved versus systolic HF, difficulty in treating HF with renal insufficiency, and difficulty in the use of beta-blockers. Although EMR is not used by all FPs, it is already adopted by the majority (n=30, 71%), and this number is expected to rise in the coming years. The effectiveness of EMR, particularly in the management of HF patients, may be improved by incorporating clinical decision support tools that provide regular and timely prompts such as electronic caremaps (see Figure 1).

Previous web-based/electronic medical record (EMR) initiatives, including modules for the management of diabetes mellitus and hypertension, show that clinical decision support that is incorporated as part of a multicomponent quality improvement initiative can lead to improvements in clinical outcomes [12-15]. To our knowledge, there have been three previous studies concerning HF management through EMR support. Leslie et al. in two studies discuss the benefits, development, and evaluation of clinical decision support software to support physicians in treating patients with HF [19-20]. These studies highlight the complexity of HF guidelines and the idea that knowledge and expert advice, in addition to guidelines, are required to optimally treat patients. They also mention the need for improving computer skills and integrating clinical decision support software into referral pathways and requests for investigation. They found that general practitioners had lower computer literacy scores than junior doctors and students (both p<0.01). In addition, it was felt by most (70%) that the clinical decision support software was more useful than written guidelines. A study performed by Toth-Pal et al. used a guideline-based computerized decision support system to assess FP confidence about diagnosis and treatment of patients with HF [21]. It was found that the FPs' confidence in the diagnosis with the use of the computerized system changed in 25% of the cases, with equal numbers of increases and decreases in confidence. The FPs also considered further investigations in 31% of the cases and medication changes in 19%. Thus, based on previous studies, electronic caremaps incorporated into EMR may be successful in improving care and outcomes for HF patients.

According to a systematic review by Go et al., HF patients in the United States who are followed by cardiologists as opposed to FP are more likely to receive evidence based care and

likely to have better outcomes [6]. It is also shown by Boom et al. and Ahmed et al. that cardiologist involvement in consultation with FPs in managing HF patients leads to better HF care outcomes [7-8]. Patients are more likely to undergo diagnostic procedures, such as echocardiography, have higher rates of utilizing evidence-based pharmacologic therapy, such as beta-blockers or ACE-I, and have lower odds of 90-day readmission. In addition, Tsuyuki et al. previously demonstrated that passive approaches to the dissemination of CCS guidelines for HF have had little impact on the use of ACE-I in HF patients, and further efforts to deliver guidelines are needed [9]. This is where HF caremaps integrated into EMRs to provide support specific to a patient, based on pre-defined evidence-based algorithms, may help FPs to make better decisions or to serve as reminders to update required patient medications.

In terms of EMR use, the large majority of FPs (n=30, 71%) in our study were using EMRs in their clinical practice. A comparison between the results of the 2007 and the 2010 National Physician Survey (NPS) shows that exclusive use of EMRs by physicians across Canada has increased from 10% to 16% and the combined use of EMRs and paper charts by physicians increased from 26% to 34% over 3 years [22]. In addition, the number of FPs using EMRs to manage chronic conditions in the 2010 NPS survey was reported to be 27% [23]. According to Schoen et al., the use of EMRs by FPs in Canada increased from 37% in 2009 to 56% in 2012 [24].

There was no consensus in our study on whether EMRs currently have helped in improving the management of HF patients with only 43% (n=13) of responses stating that they have helped. The impact of EMR on HF management may be lower than expected due to lack of implemented electronic modules available. In addition, it is a chronic disease and does not have implementation into EMRs of many associated financial incentives such as Ministry of Health and Long Term Care Heart Failure Management Initiative that still remain paper based. This is a critical aspect that shows great potential for improvement through functionalities, such as clinical decision support in HF management for FPs through their respective EMRs.

A limitation of our study is the small sample size, which restricts the generalizability of the results. The low response rate may lend itself to bias by offering more skewed results as a consequence of any outliers in data. Non-response bias may also be a factor as the surveys may more likely be completed by FPs with existing EMRs, hoping for further improvement. In addition, the survey performed was exploratory and not previously formally validated. All the FPs involved in this study were located within the Greater Hamilton Area, which is primarily an urban location. The survey response rate was low at approximately 20%, whereas the generally accepted response rate for surveys is around 30%.

CONCLUSION

In conclusion, we found that a relatively large number of FPs currently employs EMRs, and this number is expected to rise in the coming years. Many HF patients are managed at the primary care level by the FP. Many of the FPs surveyed expressed some difficulty in managing certain HF patients and medications. As such, there is a definite need for management tools that can be integrated into EMRs to provide decision-making support for FPs in managing HF.

This project provides necessary pilot work towards successful implementation of HF caremaps in EMRs. Many of the multimodal approaches for managing HF can be complex to implement, and tools such as caremaps can help provide optimal care as per the Canadian Cardiovascular Society (CCS) guidelines [2]. The great need for optimally managing HF at primary care level also calls for further investigations with larger sample sizes. There is still large potential for improving EMRs for the management of HF patients. Future directions involve performing a survey to gauge interest in electronic caremaps. Alternatively, we may look to implement electronic caremaps in some of the most used EMRs such as Practice Solutions® or OSCAR®, and perform post-implementation surveys.

APPENDIX

FP Survey can be accessed online at uojm.ca.

Figure 1: HF Caremap

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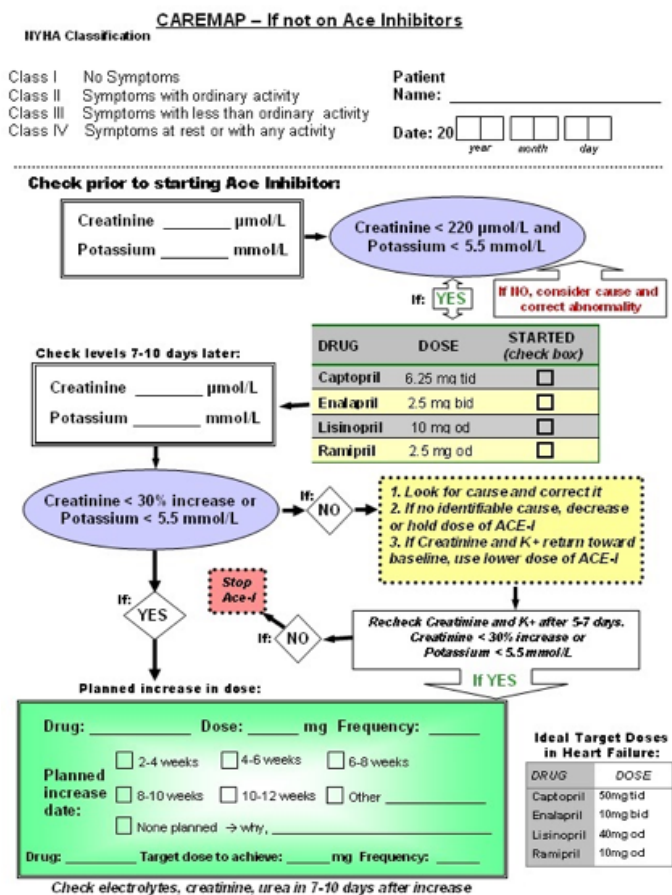2. Howlett JG, McKelvie RS, Costigan J, et al. The 2010 Canadian Cardiovas-

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