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Initiating Telephone Follow-Up After Hospital Discharge From An Impatient Psychiatric Setting to Reduce Recidivism

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IMPLEMENTATION OF A HEART FAILURE RISK SCREENING TOOL IN A PRIMARY CARE SETTING

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Dedication

I dedicate this work to my Granny who was a constant source of love, laughter, and encouragement. I know that she would be proud.

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Abstract

Introduction: Heart failure (HF) is a progressive disease that is difficult to identify in its early

stages. The Health ABC HF screening tool allowed primary care providers to identify and target

interventions at their highest risk patients.

Purpose: The purpose of this project was to introduce providers to the Health ABC HF screening

tool and assess the feasibility of using this tool in a primary care setting.

Intervention: Six primary care providers used the Health ABC screening tool for 4 weeks on

their patients over age 65 with a diagnosis of hypertension, diabetes mellitus, or

atherosclerosis. Providers then completed surveys regarding the feasibility of utilizing this

screening tool in primary care.

Results: 140 unique and eligible patients were seen by included providers. 17.1% of eligible

patients were screened by the providers. 25% of those patients screened received interventions

from the providers based on the screening tool results.

Discussion: Providers appreciated the information from the tool, but felt it was too time

consuming. The project was limited by a small sample size of providers, limited time with

providers for education, and potential for missing eligible patients based on ICD 10 codes.

Key words: heart failure, screening, prevention, risk stratification, cardiovascular, primary care

Implementation of a Heart Failure Risk Screening Tool in a Primary Care Setting

The increasing prevalence of heart failure (HF) combined with treatment expenses result in this chronic disease producing a significant burden on the United States healthcare system. The HF prevalence in adults aged greater than 20 between 2011 and 2014 was 6.5 million and unfortunately that number is predicted to reach greater than 8 million by year 2030 (Heidenreich et al., 2013). For all adults with HF the 5-year mortality is only 50% (Benjamin et al., 2018). However, HF disproportionally affects the elderly with an incidence in adults over age 65 reaching 21 per 1000 individuals and a 1-year mortality rate of 29.6% (Benjamin et al., 2018). Treatment options for these HF patients are extensive, and very expensive. In 2012 medical costs related to HF in the United States totaled $20.9 billion with an estimated projection to $53.1 billion by 2030 (Heidenreich et al., 2013).

The state of Kentucky follows these national trends. In more Kentucky counties than not, the annual death rate of adults greater than age 35 attributed to HF between 2013 and 2015 was greater than 204.4 deaths per 100,000 individuals (CDCa, 2016). In Jefferson County, Kentucky the HF hospitalization rates for Medicare beneficiaries between 2013 to 2015 was 41.6-49.5 HF hospitalizations per 1000 Medicare patients (CDCb, 2016). Counties surrounding Jefferson County in both Kentucky and Indiana have hospitalization rates ranging from 35 to 56.8 hospitalizations per 1,000 Medicare beneficiaries (CDCb, 2016).

HF is a chronic, progressive condition beginning with small pathologic structural changes in the heart and gradually evolves into a symptomatic state. The slow nature and lack of early warning signs make HF difficult to diagnose in its early stages resulting in recent practice guidelines placing increased emphasis on prevention. Current prevention strategies focus on

aggressive risk factor modification through the treatment of common concomitant conditions

that contribute to HF development. The American Heart Association (AHA) and American

College of Cardiology (ACC) recognize hypertension, diabetes mellitus, and atherosclerotic

disease as leading contributors for HF development (Yancy et al., 2013). Risk stratification tools

help providers further determine which patients are at highest risk for the development of HF.

Incorporation of a such tool into a primary care setting would allow providers to target

interventions and prevention methods for the highest risk patients.

Identification of an evidence based risk stratification tool occurred through a literature

review of CINAHL, Pubmed, and Ovid databases with the keywords "congestive heart failure,"

"heart failure," "chf," "risk prediction," "risk stratification," "screening," and "incidence".

Results were limited by English language and publication since 2008. A total of 158 articles were

further reduced by elimination of articles with titles indicating review of patients with existing

HF, focus on other cardiovascular conditions, children, medication effectiveness studies, or

primarily using echocardiogram (ECHO) or biomarkers as screening methods. Nine relevant

articles were identified which included 5 risk stratification models: Multi-Ethnic Study of

Atherosclerosis HF risk score, Framingham HF risk score, Atherosclerosis Risk in Communities

HF risk score and the Health Aging and Body Composition (ABC) HF screening tool. The Health

ABC HF screening tool was chosen as the basis for this project based on its internal and external

validation. Seven unique publications included review of the Health ABC HF screening tool,

including 2 systematic reviews, and 5 unique studies.

The Health ABC HF screening tool development occurred with a cohort of 2,935 healthy

adults aged 70 to 79 from two metropolitan areas of the United States (Butler et al., 2008). The

cohort was 47.9% male, 58.6% white, and 41.4% black. Participants were excluded if they had

difficulties with activities of daily living, cognitive impairment, inability to communicate,

intention of moving in 3 years, or concurrent involvement in a research trial requiring a lifestyle

modification. The screening tool, after correction for optimism, had a c-statistic of 0.76 for

identifying 5-year incidence of HF (95% confidence interval: 0.72 to 0.80) and a R^2=0.154 (Butler

et al., 2008).

The Health ABC HF screening tool was again validated using the Cardiovascular Health

Study cohort. This cohort consists of 5,335 adults aged 65 to 100 living in 4 counties throughout

the United States. The calculated c-statistic in this cohort was 0.74 (Kalogeropoulos et al.,

2010). This cohort was predominately white (84.7%) limiting generalizability to other races. This

study concluded that the Health ABC HF screening tool underestimated the risk for white

males, but otherwise had similar results and actual incidences to the original study

(Kalogerpoulos et al., 2010).

The Atherosclerosis Risk in Communities study cohort has also been used to validate the

Health ABC HF screening tool. This cohort of 10,106 individuals was aged 45 to 64 and a

combination of both sexes and white and black races. The calculated c-statistic of 0.78 was the

highest of the 3 studies reviewed (Agarwal et al., 2011).

In a study involving the Dallas Heart Study cohort of 2,540 individuals aged 30 to 65 the

Health ABC HF Screening tool was shown to be beneficial in the prediction of asymptomatic

structural heart damage. As the predicted risk for HF increased the observed rate of cardiac

structural abnormalities (mean left ventricular mass, concentricity, wall thickness, end-systolic

volume) also increased (P≤ .001) (Gupta et al., 2010). Additionally, as predicted HF risk

increased the left ventricular ejection fraction decreased (P < .001) (Gupta et al., 2010). The

participants classified in the very high risk group had a 16.6 fold increased odds of having

existing left ventricular hypertrophy and a 7.4 fold increased odd of existing left ventricular

systolic dysfunction when compared to the participants in the low risk classification (Gupta et

al., 2010). In a separate study utilizing 284 of the Dallas Heart Study participants the Health ABC

HF screening tool had a higher diagnostic utility for predicting Stage B HF than natriuretic

peptides (Gupta et al., 2011). There was a slight, but significant, improvement when natriuretic

peptides were used in combination with the Health ABC screening tool (Gupta et al., 2011).

The limitations of this literature include lack of validation in racial groups other than

whites or blacks. Additionally, there is no universally used method for the diagnosis of HF

meaning that some patients may have been mis-classified (Echouffo-Tcheugui et al., 2015).

Many research studies define incidence of HF based on number of hospital admissions with a

physician diagnosis of HF (Butler et al., 2008; Kalogeropoulos et al., 2010). The actual

prevalence may be much higher and would thus impact the overall predictive value of the

screening tool model.

The Health ABC HF Screening tool predicts HF incidence using 9 readily available factors

including age, heart rate, fasting glucose, known coronary artery disease, smoking history,

creatinine, left ventricular hypertrophy, albumin, and systolic blood pressure (Butler et al.,

2008). Each factor has between two and eleven classifications that yield between -4 and 6

points which are added for a total score. This allows providers to see if there is a particular

factor that is contributing a significant amount of the HF risk. A total score ≤ 2 points indicates a

low, <5%, risk of HF incidence in the next 5 years. A score between 3-5 points is average risk,

with a 5-10% 5-year risk. A high score of 6-9 points represents a 10-20% 5-year risk and a very

high score of ≥ 10 points represents a >20% 5-year risk of incident HF.

Many of the 9 factors used by the screening tool can be modified to reduce the 5-year

risk of HF (Butler et al., 2008). Providers should encourage lifestyle modifications such as weight

reduction, smoking cessation, and reduced exposure to cardio-toxic agents (Yancy et al., 2017).

Effective, long-term blood pressure control can reduce the risk of HF by up to 50% (Yancy, et al.,

2013). A goal of 130/80 mmHg in-office blood pressure is recommended (Yancy et al., 2017).

Blood pressure control should occur through diuretics, angiotensin converting enzyme

inhibitors (ACE-I), angiotensin receptor blockers (ARBs), and beta blockers (BB) before other

medications (Yancy et al., 2013). All patients with known atherosclerosis or diabetes should be

placed on an ACE-I or ARB medication (Yancy et al., 2013). ACE-I and BB impede maladaptive

left ventricular remodeling, although BB are slightly less effective (Yancy et al., 2013). Patients

with a known history of coronary artery disease or lipid disorder should be placed on statin

therapy (Yancy et al., 2013). Dysglcemia is strongly correlated to HF. A patient with a HbA1c

>10.5% has a 4 fold increased risk of incident HF when compared to a similar patient with a

HbA1c <6.5% (Yancy et al., 2013).

Theoretical Framework

Lewin's Planned Change Theory was used as the theoretical framework for this project.

This theory divides planned changes into three phases: unfreezing, implementing change, and

refreezing. Unfreezing involved examining the pre-existing system and working to increase the

driving forces that supported a new screening tool. Driving forces included a desire to prevent

HF, improve patient outcomes, and reduce the financial burden of HF. This step also involves

decreasing the amount of restraining forces, such as a perceived lack of time, or perceived lack

of benefit of the screening tool. Implementation involved communicating to participants about

the Health ABC HF screening tool along with education about prevention strategies. During

implementation the driving forces must exceed the restraining forces in order for the

implementation to be successful. The refreezing phase occurs as participants adapt to their new

normal and embrace the change. (Oberleitner, pp370-371)

Setting and Organizational Assessment

This project took place at the University of Louisville Physician Centers for Primary Care

downtown office in Louisville, Kentucky. The focus of this office is health promotion, diagnosis

of disease, and care of chronic illness in adult patients aged 18 and older. The office has 5

physicians who see patients between 1-5 days/week and 3 nurse practitioners who see patients

5 days/week. Some of the physicians in this office see patients part-time, as few as 4 hours per

week. A letter of support was obtained from the office's Director of Practice.

Purpose

The purpose of this project was to introduce providers to the Health ABC HF screening

tool and assess the feasibility of using this tool in a primary care setting.

Intervention

This project was implemented by the student investigator beginning in March of 2019.

The implementation period lasted 8 weeks. On the first day of the project, during a previously

scheduled provider meeting, the providers were informed of the project during a 10 minute

education session. Providers who were unable to attend the education session were educated

one on one by the student investigator. They were provided with copies of the screening tool

and a reminder card that included HF prevention strategies. Providers were asked to complete the screening tool for all of their patients over age 65 with a diagnosis of hypertension, diabetes mellitus, or atherosclerosis. The screening tool paper also asked providers if the score impacted their decision making for that patient and what interventions the providers implemented. The screening tools were used for 4 weeks. Afterwards providers were asked to complete a feasibility survey to express their opinions about use of the screening tool in their practice. The timeframe for survey completion was four weeks. This project was approved by the University of Louisville Institutional Review Board prior to implementation.

Participants

All of the providers (medical doctors and nurse practitioners) who practiced in the office ≥8 hours per week were eligible for inclusion in the intervention. There was no exclusion criteria. Six providers, 3 nurse practitioners and 3 physicians, met this criteria and were invited to participate. Four of these providers attended the provider meeting where they were educated on the intervention, the other 2 physicians were educated one on one. There was no consent required for this intervention.

Data Collection

Paper HF screening tools were completed by providers for each of their eligible patients. These screening tools included no patient identifiers. All completed screening tools were placed in a collection box and collected by the student researcher weekly. After completion of the screening tool usage period, feasibility surveys were completed by the providers and anonymously placed in a collection box to be collected by the student researcher. Aggregate

data regarding the number of eligible patients seen by the provider participants during the

screening tool usage period was reported by a facility business intelligence developer.

Measurement

The Health ABC HF Screening Tool was used for providers to assess their patients 5-year

risk of HF. This tool was originally validated in 2,935 community-dwelling adults aged 70 to 79

with a c-statistic of 0.72. In a sample of 5,335 adults aged greater than 65 the screening tool

predicted risk with a c-statistic of 0.74. A study involving a sample of 10,106 adults aged 45 to

65 yielded a c statistic of 0.78. The health ABC HF screening tool involves 9 items that are

assigned points ranging from -4 to 6. The scores from each of the 9 items are added to

determine a final score which correlates with a 5-year risk prediction for developing HF. Total

scores ≤ 2 represent a low risk with a <5% risk of developing HF in the next 5 years. Total scores

of 3-5 points represents an average risk and a 5-10% 5-year risk, scores of 6-9 points represent

a high risk and a 10-20% 5-year risk, and scores of ≥10 points represent a very high risk and a

>20% 5-year risk.

Additionally, providers were asked to complete a feasibility and satisfaction survey to

assess their perspective of using this tool in their busy primary care practice. This survey was

developed by the student investigator. It involved 7 items rated on a 5-point Likert scale

ranging from 1 = strongly agree to 5 = strongly disagree. The survey also asked 3 short answer

questions about years in practice, approximate number of times using the screening tool, and

for any additional questions or concerns.

The primary outcome for this project was to determine the consistent usage of the

screening tool by comparing the number of screenings completed to the number of eligible

patients seen during the screening tool period. Provider satisfaction was a secondary outcome

assessed by the provider survey.

Results

A total of 24 screenings were completed by the included providers. During the first week

of implementation 16 screenings were completed, none were completed in week 2, 1 was

completed in week 3, and 7 were completed in week 4. The total scores on the screenings

ranged from -5 to 10. The breakdown of risk categories can be seen in Table 1. Only 2

screenings had any missing data. Both missing items were smoking history. The questions on

the screening tools asked if the patients risk category impacted the provider's decision making.

Six screening tools stated that the plan of care was impacted. Of the adjustments that were

made based on the screening tool, 4 patients were given lifestyle education, 2 had medications

adjusted, 1 ECHO was ordered, and 1 natriuretic peptide was ordered. Of note, 6 patients (25%)

had adjustments, some patients had more than one adjustment made.

Table 1

Risk Categories of Patients Screened

Risk Category	Total Score	Patients in this Category
Low, <5%	≤ 2	10
Average, 5-10%	3-5	8
High, 10-20%	6-9	5
Very High, >20%	≥10	1

Of the 6 providers invited to participate in this project 4 completed the feasibility

survey. Providers years of experience ranged from 7 months to 11 years. On the survey one

provider commented that they did not do any screenings because they did not see any heart

failure patients during the screening tool usage period. The other providers indicated using the

tool between 5-10 times during the usage period. 3 of the 4 providers indicated that the

screening tool was easy to use, one response was neutral. Two providers indicated that the tool

was valuable for clinical decision making, the other 2 providers were neutral. Three providers

indicated the tool was useful in a busy primary care practice, one response was neutral. Three

providers indicated that the tool was not too time consuming, however the fourth provider

indicated that it was too time consuming.

In total 140 patients were seen by the 6 included providers during the 4 week trial

period who met criteria for screening. 130 of the patients had hypertension, 55 had diabetes,

and 17 had atherosclerosis. 17.1% of these eligible patients were screened. The 6 invited

providers varied greatly in the number of eligible patients. Four of the included providers saw

less than 20 eligible patients during the usage period. The other 2 providers saw greater than

50 eligible patients.

Table 2

Breakdown of Eligible Patients by ICD 10 Code

ICD10 Code	ICD10 Code Description	Patients with diagnosis
I10	Essential hypertension	130
E11.9	Type 2 diabetes mellitus, without complications	51
E11.65	Type 2 diabetes mellitus with hyperglycemia	4
170.90	Unspecified atherosclerosis	0

I70.213	Atherosclerosis of native arteries of extremities with intermittent claudication, bilateral legs	0
I70.223	Atherosclerosis of native arteries of extremities with rest pain, bilateral legs	0
I25.10	Atherosclerotic heart disease of native coronary artery without angina pectoris	17

Data was entered into SPSS Version 26. This was used to organize data, and identify any missing information. Additionally, this software was used to create frequency distribution tables of the data from the screening tool papers and responses on the provider surveys.

Discussion

Interpretation

Implementation of a paper-based HF screening tool in a primary care setting was ultimately unsuccessful. Feasibility surveys indicated a favorable view of the value the screening tools bring to a busy practice. However, only 17.1% of eligible patients were screened. Only one provider indicated a reason for not using the tool consistently stating in their survey that the tool was too time consuming.

Of the patients who were screened, 25% had their plan of care impacted. The most common intervention used by providers was providing additional lifestyle education. Interestingly, these interventions occurred on 4 average risk patients and only 2 of the 5 high risk patients. There was one very high risk patient who did not have any interventions, however the provider did note in the margins that the patient was already on an ARB medication. A

provider also noted that for one of the high risk patients that did not receive additional

interventions that the patient was on an ACE-I and refused an ECHO.

Providers appreciated being able to classify their patients HF risk, however they did not

use the tool consistently. One provider indicated they did not have any HF patients which

represents a misconception of which patients should have been screened. Providers could have

benefitted on more in-depth education regarding the purpose of the screening tool and which

patients were eligible for screening. Some of the providers also felt that the screening tool was

too time consuming to use consistently. A screening tool built into the electronic charting

system may have made the tool quicker to use, however, may still require providers to take

time to input some data points. Future practice change may be more effective if providers are

not required to take extra time to collect information, and calculate a total score. The provider

comments in the margins of the screening tool reveal that providers are often already treating

their patients with many of the things that reduce HF risk. Providers indicated in 18 patients

that the screening tool did not impact their decision making, however their comments in the

margins reveal that 2 of these patients were already on ACE or ARB medications and 5 had

already had a natriuretic peptide testing and ECHO, and another 3 had been imaged on ECHO.

Limitations

Limitations of this project include implementation in a single setting and a limited

sample size of providers. The schedule of the providers also limited this project. Many of the

physicians in this office only practice 1-2 days/week making it difficult for them to incorporate

new practices into their care. The education session for this project was also very limited in

time. Perhaps a longer education session would have resulted in fewer questions among

providers and more consistent usage. The percent of eligible patients screened was low, and

average risk and therefore the screening tool didn't support making changes to the treatment

plan. A larger amount of patients in the higher risk or very high risk category may have yielded

more interventions. Lastly, ICD codes used to determine eligible patients had to be searched

individually by information technology support staff. Unfortunately, due to the limitations of

the information technology support staff, all possible ICD codes of each disease were not

searched. This results in the total number of eligible patients seen in the office being more than

reported.

Conclusions

This project assessed the feasibility of the implementation of a 9 item paper HF

screening tool in a busy primary care setting. Providers felt that the screening tool did provide

useful information for their care of patients, despite this they did not use the screening tool

consistently. One provider noted that the screening tool was too time consuming to be used

routinely.

Providers often made comments in the margins of the screening tools that they were

already taking prevention methods by using ACE and ARB medications as well as getting ECHO

imaging and natriuretic peptide testing. While having an number indicating a risk for heart

failure certainly brings an objective aspect to patient care, it seems that it is not enough for

providers to dedicate their time to consistent use. Future methods of heart failure prevention

in primary care must be concise and easily workable into existing practice. Pocket cards with

high risk conditions and prevention methods or electronic alerts may prove to be enough of a

reminder.

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