



**Proceedings of the Home Healthcare,
Hospice, and Information Technology
Conference**

Volume 1

Washington – DC

November 2014

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Development and Implementation of a Predictive Model of Hospitalization Risk among Pediatric Home Care Patients



Daniel Kurowski¹, David Russell¹, Tasha Hamilton¹, Rocco Napoli², Robert Rosati³

PREDICTIVE models of hospitalization risk can be used to identify patients who may benefit from more intensive services and transitional care interventions. Previous work on predictive hospitalization risk models for adult home care patients has been undertaken. The aim of this presentation is to describe the development and implementation of a predictive model of hospitalization risk for a pediatric homecare population using information collected at the start of home care. We examined a range of demographic and clinical characteristics including: referral source, prior admission status, the presence of a complex chronic condition, self-rated general health, the use of therapy equipment, and prescription medications.

Methods: We conducted a retrospective observational study of pediatric home care patients who were served by a large, urban, not-for-profit home healthcare agency and who were admitted and discharged from 2008 to 2011 (N=14,216). Information was obtained from patient intake, clinical assessment and medication history databases. We employed a logistic regression model with backward selection to examine the demographic and clinical characteristics associated with hospitalization within 60 days of admission to home care. Predicted probabilities were calculated from the model and used to estimate each patient's level of hospitalization risk. Concordance between predictive model scores and judgments of hospitalization risk made via chart reviews by three clinical nurse specialists was evaluated using Cohen's kappa statistic.

Results: A number of clinical factors were found to be significantly associated with hospitalization, including: the presence of a complex chronic condition, use of medical therapy equipment (oxygen, IV/infusion therapy, and enteral/parenteral nutrition), fair or poor self-rated health, and prescriptions within certain therapeutic classes of medications (i.e. ulcer medications, psychotropic medications, anticonvulsants, anti-nauseates, penicillins, hematinics, and sedative barbiturates). We also identified service characteristics that were significantly associated with hospitalization risk, including: referral from the hospital, a prior history of home care service, and enrollment in a managed care insurance plan. Patients with the highest predicted level of risk had a hospitalization rate of 28.7% compared to a hospitalization rate of 1.2% among patients with the lowest predicted level of risk. Results from the model validation indicated a moderate level of agreement between the predictive model and the nurse specialist's risk judgment (Cohen's kappa=0.44); reasons for moderate agreement will be reviewed in detail. Hospitalization risk scores for newly admitted patients are disseminated to supervisors once a week via e-mail using an automated SAS program.

Discussion: Our findings suggest that information collected at the start of home care can be used to identify pediatric patients who have a greater risk of hospitalization. In our population of pediatric patients, 63% of hospitalized home care patients were discharged to the hospital within 14 days of admission to home care. Special attention must be paid to the information technology (IT) requirements associated with moving data into an analytic warehouse that is capable of processing and returning a risk score. IT applications that reduce the lag time between assessment and processing may be useful to home care organizations.

Conclusion: The use of data-driven risk measures can be used to assist administrative staff in managing clinical resources for pediatric home care patients, however, special attention should be made to ensure timely dissemination. Further research is needed to evaluate whether strategies implemented to mitigate risk factors are effective in reducing hospitalization rates among this population.

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Developing a Tool to Support Decisions on Patient Prioritization at Admission to Home Health Care



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MILLIONS of Americans are discharged from hospitals to home health every year and about third of them return to hospitals. A significant number of rehospitalizations (up to 60%) happen within the first two weeks of services. Early targeted allocation of services for patients who need them the most, have the potential to decrease readmissions. Unfortunately, there is only fragmented evidence on factors that should be used to identify high-risk patients in home health. This study aimed to (1) identify factors associated with priority for the first home health nursing visit and (2) to construct and validate a decision support tool for patient prioritization.

Methods: We recruited a geographically diverse convenience sample of nurses with expertise in care transitions and care coordination to identify factors supporting home health care prioritization. This was a predictive study of home health visit priority decisions made by 20 nurses for 519 older adults referred to home health. Variables included socio-demographics, diagnosis, comorbid conditions, adverse events, medications, hospitalization in last 6 months, length of stay, learning ability, self-rated health, depression, functional status, living arrangement, caregiver availability and ability and first home health visit priority decision. A combination of data mining and logistic regression models was used to construct and validate the final model.

Results: The model identified five factors associated with first home health visit priority. A cut point for decisions on low/medium versus high priority was derived with a sensitivity of 80% and specificity of 57.9%, area under receiver operator curve (ROC) 75.9%. Nurses were more likely to prioritize patients who had wounds (odds ratio [OR]=1.88), comorbid condition of depression (OR=1.73), limitation in current toileting status (OR= 2.02), higher numbers of medications (increase in OR for each medication =1.04) and comorbid conditions (increase in OR for each condition =1.04).

Discussion: This study developed one of the first clinical decision support tools for home health, the PREVENT- Priority for Home Health Visit Tool. Further work is needed to improve the specificity and generalizability of the tool, implement an electronic version and test its effects on patient outcomes.

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Development of an eHealth Measures Compendium



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CONSISTENT and well-validated metrics of design, efficiency, and improved communication are necessary to determine the true benefit of any eHealth intervention without which healthcare organizations cannot 1) calculate return on investment of eHealth technology; 2) effectively address barriers to adoption that stem from these metrics (i.e. usability, accessibility of a technology); or 3) accurately estimate the likelihood of adoption. The goal of this project is to create a compendium of potential metrics that could be used in any study using eHealth interventions and create a standardized array of recommended metrics that will support both eHealth operations and research.

Methods: Working with an experienced health sciences librarian, an extensive list of search terms were developed addressing platforms (e.g., cell phone, patient portal), measurement (e.g., performance measurement, survey development) and functions (e.g., health information seeking). To date, major healthcare literature databases have been searched including Scopus, Pubmed, Cumulative Index of Nursing and Allied Health Literature (CINAHL), Health and Psychosocial Instruments (HAPI), and PsychInfo. To build this compendium effectively, the literature search will extend beyond a review of the medical literature and include research from the IEEE (Institute of Electrical and Electronics Engineers) and ACM (Association for Computing Machinery) digital libraries. Reliability estimates will be explored using the range of current statistics available (e.g. internal consistency, test-retest reliability, alternate forms reliability) as will validity estimates (content validity, construct validity, predictive validity, discriminant validity). Each metric will be described using a uniform format. A brief overview of the instrument's development, scoring procedures, psychometric properties, key references on the development and/or use of the instrument, and the actual scale (if available) will be included. The final compendium will be searchable by key words (using MeSH terms) so each metric will be cross-indexed by the topic/construct covered, the types of technology the metric addresses, and populations where the metric has been used. The database will also include references to articles or abstracts on use of the metric. Finally, at the conclusion of the search and review, we will upload our information to the Grid-Enabled Measures (GEM) database, sponsored by the National Cancer Institute.

Results: The study is in progress. We have developed and tested the review instrument using the uniform requirements addressed above. To date, 15 instruments known to the investigators prior to the search have been reviewed. The search of the healthcare literature resulted in 33,217 citations; approximately 70% have undergone a title/abstract review. Of those, less than 1% describe an instrument and less than 4% describe use of an instrument that potentially could be included in the compendium.

Discussion: Evaluation of eHealth is unique from evaluation of other interventions in three important ways that warrant development of a unique compendium: 1) it must include evaluation of the technology platforms and functions in terms of usability, functionality, and availability of the technology to target users; 2) eHealth applications are promoted to improve efficiency and accessibility, but there are no uniform widely agreed upon metrics; and 3) eHealth interventions aim to improve communication in one form or another, thus metrics are needed that quantify specifically the degree to which communication is improved.

Conclusion: The results of this project will provide critical insights regarding existing eHealth measures and identify gaps where new metrics are needed. The compendium can also inform future studies so that the results from multiple studies can be compared and synthesized because they used the same handful of metrics. A white paper will be developed to provide a critical synthesis and analysis of the current state of evaluation of eHealth in light of the strengths and weaknesses for each of the domains covered.

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Personal Health Information Management in Older Adults: Use of Patient Portals



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INFORMATION technologies for assisting older adults in managing their health information (e.g., patient portals) have not been widely adopted, in part because they are developed without knowledge of what older adults want and their health information management practices. The purpose of our AHRQ-funded SOARING (Studying Older Adults and Researching Information Needs and Goals) Project is to investigate the personal health information management goals, activities and practices of older adults in a variety of living environments. Findings will be used to inform the design of tools which are tailored to the needs and health information management practices of older adults.

Methods: We conducted 39 in-depth interviews with older adults whom we recruited from adult residential centers, assisted living, and independent homes and apartments. We used a purposeful recruitment strategy to ensure diverse representation of age, gender, socio-economic status, and racial and ethnic background. Inclusion criteria included age 60 years or older, ability to speak and write English, lack of severe cognitive impairments, and ability to provide informed consent. Interviews consisted of standardized surveys regarding demographics, overall health, social networks and use of technology, in addition to open-ended questions concerning how participants manage their personal health information. Interviews focused on health and personal health information management in general and did not focus on the use of specific technologies. We audio-recorded, transcribed, and analyzed interviews for qualitative themes.

Results: Participants described information management styles ranging from complex systems for tracking medication use and clinical visits to simply discarding all but the most critical personal health information. Seventy two percent of participants (28/39) reported using a computer at least 2-3 days per week and 56% of participants (22/39) reported using a computer 6-7 days per week. The majority of computer users reported accessing the Internet. A significant number of participants (8/39) mentioned their use of patient portals, defined as a secure Website through which patients can access a personal health record and often certain information from an electronic health record.¹ The ages of those eight participants ranged from 73 to 93. By and large, those participants live independently, are well-educated, and represent middle to higher incomes. The majority of participants using patient portals said they felt positive about the specific portal they use. A majority of the patient portals mentioned were implementations of Epic MyChart™ (Epic Systems Corp, Verona, WI). Specific discussion about patient portals generally focused on their usefulness and ease of use. Several participants mentioned they have greatly reduced their own personal record keeping of health information because they access this information through the patient portal. One participant reported that they used a portal briefly, but stopped because of frustrations with logging in.

Discussion: Many older adults are using computers and accessing the Internet. Despite reports of barriers to the use personal health information technologies by older adults,²⁻⁶ a surprising 20% of the older adults we interviewed use patient portals to manage personal health information. This trend is encouraging for potential future adoption of patient portals by older adults. Expanded research is needed to determine the general penetration of patient portals, factors that contribute to portal use by older adults, and associations between use of patient portals and independent living.

Conclusion: Study findings highlight the value of patient portals as a platform to facilitate management of personal health information and demonstrate their potential to help older adults maintain wellness and independence as well as to enhance home care services in various residential settings.

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Toward Effective and Efficient Health IT Adoption in Home Healthcare: A Qualitative Investigation of Maryland Home Health Agencies



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HEALTH information technology (HIT) becomes a critical tool in home healthcare as its utilization increases. Compared to other types of healthcare providers, HIT adoption levels among home health agencies (HHAs) have traditionally been lower.¹ Furthermore, various eligibility issues prevented HHAs from receiving financial incentives for adopting electronic health records (EHR),² which can be considered among essential HIT systems. Most HHAs in the United States (US) are in a position to adopt HIT solutions in highly budget constrained settings where it is crucial to achieve effective and efficient HIT adoption. In this context, effectiveness means creating the maximum value possible with limited resources; efficiency means minimizing the overheads of HIT adoption. We conducted a qualitative study to obtain rich contextual information strengthening the evidence base about the (i) HHAs' challenges and opportunities related to delivering care and conducting business, which should derive HIT adoption strategies and decisions to achieve effectiveness (ii) contextual determinants of HIT adoption that should be managed to achieve efficiency by minimizing overheads.

Methods: Semi-structured phone interviews were conducted with the executives and managers of thirteen Maryland HHAs. Maximum variation was used in recruitment by considering the HHAs' size, organization type, business model, geographical areas served, and age. For each recruited HHA, one interview was conducted involving either two participants, one knowledgeable in HIT and the other in home care, or involving only one participant knowledgeable in both areas. The topical areas were based on (i) a number of established systems analysis techniques such as problem analysis, duration analysis, activity-based costing, outcome analysis, and technology analysis to document the HHAs' challenges and opportunities (ii) the constructs in the Rogers' diffusion theory³ to uncover the contextual determinants of adoption. The interview transcripts provided the raw data analyzed using the Framework method.⁴⁻⁷ The analysis of qualitative data included constructing an index, open coding, summarizing and sorting, and eliciting descriptive and explanatory accounts.

Results: (i) Coordinating clinical and administrative work flows was stated as an important challenge. Complying with the strict and changing Federal rules for reimbursements, therapy assessments, and physician approvals was described as excessively time consuming and costly, particularly for smaller HHAs. It was reported that HHAs use telephone and fax as the primary means of health information exchange (HIE). Most participants complained about not having adequate access to patients' medical history during admissions. Hiring and training qualified clinicians was considered to be a challenge for HHAs. Some participants noted that the scheduling and training difficulties increase greatly as the number of part-time employees increase. Educating and training patients and caregivers was found to improve outcomes, but it required overcoming cultural, educational, and age-related barriers. Smaller HHAs experienced significant difficulties with getting referrals. (ii) Most HHAs lacked defined processes for analysing their HIT requirements driven by their actual improvement needs, evaluating alternative HIT solutions, and making HIT adoption decisions. Perceived complexity of using HIT was mentioned as a challenge but the HHAs were able to train most clinicians successfully if their training budgets allowed. Still, the participants mentioned that using EHR at patients' home presented usability issues which sometimes detracted from the quality of interaction. The participants perceive HIT to be useful but they said the opinions varied among their clinicians. While larger HHAs customized HIT solutions to a certain extent, most HHAs avoided customization to prevent future problems. Vendor lock-in occurred commonly because HHAs lacked in-house IT resources and tried to reduce the compatibility issues between the existing and new systems. HHAs' service-oriented social norms and values were found to be consistent with using HIT for improvement. The participants valued peer advice and used their association as a communication channel to increase their HIT awareness and knowledge.

Discussion: It seems that HHAs' clinical, administrative, and management functions require a strong coordination which can benefit from HIT. Increasing HHAs' awareness about existing HIE capabilities and developing better HIE infrastructures could improve the quality of care by facilitating admissions and care delivery. Education and training of patients and caregivers is a promising area for quality improvement. Regulatory agencies should consider that frequent changes in regulations will require changes in HIT systems increasing HHAs' costs.

Conclusion: The majority of the participating HHAs have made considerable progress in HIT adoption without receiving

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financial incentives. Most of them were interested in increasing their HIT adoption levels. Developing an evidence-based HIT adoption environment and culture is likely to benefit HHAs in their HIT projects.

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Sharing the journey: Technology-Enhanced Transitional Palliative Care



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THE majority of palliative care services are located in urban medical centers with few deliberate or consistent approaches to coordinate care across geographically-diverse settings. This pilot study linked two proven strategies, transitional care and use of health information technology, in an innovative way to extend palliative care across settings and improve outcomes for rural patients and their caregivers. The purpose of this pilot study was to determine feasibility, acceptability, and initial outcomes of a technology-enhanced transitional palliative care (TPC) intervention with

Methods: In this randomized controlled trial, patients/caregivers receiving inpatient palliative care consultation in a rural Minnesota hospital received either TPC or usual care for 8 weeks after hospital discharge. TPC consisted of one home visit, periodic phone calls, and weekly video session visits with a nurse via iPad. Attention control patients received weekly telephone calls by a study team member. All participants were offered a subsequent qualitative telephone interview to assess feasibility and acceptability. Transcripts were analyzed using content analysis.

Results: Five patients and 7 caregivers were interviewed. Technology use was feasible and acceptable after minor initial glitches were resolved; all valued viewing their nurse during video sessions. Care coordination was a dominant theme. Intervention patients/caregivers experienced satisfactory care coordination, enjoyed continuity provided across settings, and valued anticipatory guidance received. Care coordination and relationship was absent for the control group; all needed to manage care and healthcare interactions alone.

Conclusion: TPC is not only feasible, but desired by rural palliative care patients/families transitioning from hospital to home or other care settings. Video technology was a welcomed adjunct to fostering and maintaining the provider/patient relationship

Implications for research, policy, or practice: Palliative care should continue beyond the hospital doors; ongoing follow-up is needed for often worsening healthcare issues for these patients. Policy needs to change to provide reimbursement for innovative palliative care strategies that span care settings

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Sustainability of Home Telepathy Programs: A Systematic Review



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As part of the Medicare Care Transitions Act of 2009, the federal government mandated reductions in re-hospitalizations through better care coordination and follow up services. Remote monitoring technologies such as telehealth has emerged as a potential solution to reduce re-hospitalization and healthcare utilization costs and manage chronic diseases in the home health community. However, sustainability of home telehealth programs remains a major challenge with unclear understanding of factors contributing to discontinued or sustained telehealth use. Earlier systematic reviews have focused on the effectiveness of home telehealth programs for physiological or behavioral outcomes,¹⁻⁴ but they have not addressed such programs' sustainability.

Methods: To address this knowledge gap, we present here a systematic review of articles published from 1996 to 2013 within the databases of CINAHL, Pubmed/Medline, PsychInfo, Web of Science, Cochrane Reviews to identify barriers to and facilitators for sustained telehealth use by home health patients and clinicians for chronic physiological disease management. For this review, we used the search terms of telehealth, telemonitoring, telecare, telemedicine, and telehomecare and adapted Craddock's definition of sustainability for telehealth services as the use of home telehealth services that holds the promise of being absorbed into routine health-care delivery including an increasing demand for those services, as well as acceptance of such services among healthcare providers along with a commitment to invest in them. Articles were included if they reported on longitudinal investigations of telehealth usage by home health agencies and addressed the management of chronic cardiovascular disease, diabetes, and obstructive pulmonary disease in older adults age 65 years or above. Data extraction using PRISMA guidelines and quality appraisal using Mixed Methods Appraisal Tool (MMAT) was conducted on relevant empirical studies. Thematic analysis across the studies and narrative summaries were used to synthesize the findings from the included studies. From the final articles, the following data were extracted: (1) study design; (2) study quality; (3) characteristics of the participants, including demographics, diagnoses, and role in the telehealth program; (4) data collection methods; (5) description of the telehealth program model, and (6) determinants of the sustainability of home telehealth programs.

Results: The initial 3920 citations were reduced to 943 after applying the initial search criteria and eliminating duplicates. After title and abstract search, we abstracted 142 full articles of which 18 articles,⁵⁻²² of moderate quality met the inclusion criteria. Full-texts were retrieved by a graduate research assistant and reviewed by the first two authors. Majority of the studies were conducted in UK (9) & US (7), with 1 in Canada and the Netherlands each. The articles are recent; 12 of the 18 studies were published after 2010. Twelve of the studies had qualitative designs; these included case study, phenomenological, and ethnographic approaches, as well as 3 process evaluations of randomized controlled trials. The other studies included five quantitative studies which included 1 descriptive usability study, 1 survey and 3 secondary analyses of retrospective data; and 1 mixed methods study. Sample sizes ranged from 12 to 82 for the qualitative studies and from 132 to 403 for the survey and secondary analysis studies. Participants included only patients (10 studies), only clinicians (4), or mixed samples of both patients and clinicians (4). Patient diagnoses targeted by the telehealth programs included only heart failure (5 studies), only COPD (5), only diabetes (2), or any of those three chronic diseases (7). Major themes that on sustainability of home telehealth programs included: user perceptions on effectiveness of home telehealth programs for achieving intended outcomes, tailoring of home telehealth programs to patient characteristics and needs, communication and collaboration among telehealth users, home health organizational processes and culture, and technology usability and innovation.

Discussion: In summary, to realize the potential of telehealth services for chronic disease management, future program redesign must (1) recognize formal reorganization of work between the staffs of home health service settings to include partnership and accountability negotiation, system interoperability, and shared visions for patient care management; (2) identify criteria for patient characteristics to enable telehealth service delivery tailored to individual patients' capabilities and context; (3) include clear guidelines and protocols for patient teaching, mechanisms for feedback and response, and negotiation of patient responsibilities, empowering patients to become self-reliant in their care management; (4) include stakeholder input during program implementation for improved incorporation within workflow and life routines; (5) improve technical quality of communication; and (6) enhance device usability tailored to elder use.

Conclusion: The findings of this systematic review have important implications for sustained usage of telehealth programs by home health service settings and can help realize the potential of telehealth for chronic disease management.

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Use and Satisfaction With Wearable Activity Trackers Among Community Dwelling Older People



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THE use of wearable devices for activity tracking (including exercise and fitness) has increased greatly yet there is relatively little research on the use of wearable devices among older people. This is important as older users may have different needs than younger users; their exercise and activity patterns and preferences have been reported to be different as well. The purpose of this study was to compare three existing wearable devices on measures of use (step and calorie counts) and satisfaction. This study is a secondary analysis of a larger study that tested an investigator developed device and algorithms for human activity classification.¹

Methods: Thirteen community dwelling older people from a continuing care retirement community were recruited to wear JawBone UpTM, Nike+ FuelbandTM and Fitbit FlexTM for one day from the time they awoke until they went to bed. Participants wore all three devices simultaneously as part of the testing of the investigator developed device. The devices recorded the step and calorie counts as programmed and released by the manufacturers. Falls risk assessment was done using the Missouri Alliance for Home Care (MAHC) falls risk assessment. Following the use of the devices, the System Usability Scale (SUS) was completed by the participants to determine satisfaction with the devices.

Results: The 13 participants ranged in age from 72-92 years; 6 were female. The falls risk assessment scores ranged from 2 to 7, with a mean = 3.84 and SD = 1.2. Based on the recommended MAHC cut score of 4 or higher for being at risk of falls, 11 of 13 (84.6%) participants were considered at risk for falls. The recorded number of steps and calories varied widely between the three devices. Mean step counts by device were: JawBone UpTM = 3894 (SD = 3089.8), Nike+ FuelbandTM = 2273 (SD = 1705.6) and Fitbit FlexTM = 4998 (SD = 3153). Mean calorie counts by device were: JawBone UpTM = 2107 (SD = 152.8), Nike+ FuelbandTM = 316 (SD = 136.5) and Fitbit FlexTM = 2511 (SD = 221.2). Although the bivariate correlations between the step counts were all above 0.92, there were individual differences as high as 6000 steps different at the individual participant level. There were low correlations between the calorie counts, with correlations as low as 0.39 between JawBone Up and FitBit. Correlations between falls risk and step counts ranged from -0.31 to -0.41 and between falls risk and calorie count from 0.09 to -.30; none were statistically significant although the small sample size explains the lack of statistical significance. The SUS scores ranged from 37.5 to 82.5 on a scale from 1 to 100, with higher scores indicating more satisfaction; the mean was 66.3 and SD was 11.9.

Discussion: The MAHC falls risk assessment has two sets of cut scores: 4 vs 6 (Calys, Gagnon and Jerrigan). Use of the higher cut score would result in only one of the participants being considered at risk. The wide range in step counts as measured by the device brands within each participant was surprising and may be accounted for by differences in step length, pace of walking and different sensitivities and algorithms within each device brand. There is evidence that slower walking speed affects the accuracy of step count from a tri-axial accelerometer (Cleland et al 2011) and that testing in non-laboratory environments decreases the accuracy of the devices, although there was wide variation in how much the accuracy fell (Feito 2012). To determine which of the commercial devices is most accurate requires further study to measure actual step count and step count as recorded by the devices. Performing this research with older adults with varying step lengths and walking pace would validate the findings from other research. Calorie counts were derived from the devices based on the proprietary algorithms. The calorie counts had even lower correlations and wider ranges within the same participants. This finding calls in to question whether older adults want to use the calorie counts from these devices. The participants were moderately satisfied with the devices using the SUS, perhaps from wearing all three devices simultaneously for testing the investigator-developed device.

Conclusion: Findings from the present study suggest that older adults are moderately satisfied with the wearable devices. The measure of step count indicated wide variations within some participants although the correlations between the devices were high. Further research is needed to validate the step counts and calorie tracking in community-dwelling older adults before recommendations can be made for use of these devices by home health clinicians. While fitness devices are important technological supports for measuring physical activity, it is not clear whether these devices will meet the needs of community-dwelling older adults.

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The Electronic Collection and Presentation of Nocturnal Heart Failure



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 HEART failure is a major public health problem in the United States (U.S.), with high personal and institutional costs.^{1,2} Reducing heart failure readmissions is a national priority.^{3,4} Most heart failure data is often have difficulty appropriately recognizing and responding to their worsening heart failure.⁵⁻⁸ Heart failure patients experience a high burden of night time symptoms that reduce quality of life and increase their risk of hospitalization.⁸⁻¹³ Unfortunately, there is little systematic literature addressing nocturnal heart failure, despite new findings that a number of physiological functions exhibit circadian rhythmicity, including cardiovascular function¹³ stress,¹⁴ and extracellular fluid shifts.^{redolfi_s_nocturnal_2010} The current approach to the description of heart failure relies on data collected in hospitals and clinics. The problem is that most heart failure patients experience acute exacerbations outside of hospitals and clinics, often at night, at home, when signs and symptoms of disease are not systematically collected. This investigation explores the application of FDA approved technology¹⁵ to acquire information related to the detection of progressive heart failure decompensation at home.¹⁶

Methods: This study assesses the feasibility of using physiologic data acquisition devices and a tablet-based application to collect disease-related data in home-dwelling heart failure patients. After data have been collected, clinicians assess the usability of an electronic display of nocturnal heart failure information derived from the database of physiologic and subjective data. This study asks the following research questions: 1) What is the feasibility of collecting ecologically valid physiological data (heart rate, respiratory rate, blood oxygen saturation, blood pressure, and weight) and subjective data (self-assessment features such as relative shortness of breath, swelling, pain, mood, appetite) by home-dwelling heart failure patients? 2) Can an electronic display of physiological and psychological data be constructed that meaningfully conveys nocturnal heart failure information? 3) What is the patients' and clinicians' assessment of the usability of a system for electronically collecting and presenting nocturnal heart failure information? The setting for this study is Walter Reed National Military Medical Center.

Results: The results of the investigation are pending completion of data collection. We will determine the feasibility of collecting and displaying physiologic and subjective data collected from home-dwelling heart failure patients. Descriptive and summary statistics will be used to characterize the sample and describe feasibility. Patients will evaluate the usability of the data collection devices using the System Usability Scale, which is a 10-item instrument assessing dimensions of usability.¹⁷ Each dimension of usability is assessed on a 5-point Likert scale. Responses are calculated to produce a score from 0 to 100, with 68 representing an average score. Intra-class correlations will be calculated across devices and patients. With the collected data, we will create an electronic display of nocturnal heart failure information. Clinicians will assess usability of the information display with the System Usability Scale.¹⁷ The investigators hypothesize that the mean score will be greater than 68. This hypothesis will be evaluated with the two-tailed Student's t-test. The study is powered (n=37) to detect a 10-point difference at 0.80 power, alpha = 0.05.

Discussion: There is little or no research on the physiological and subjective states of home-dwelling heart failure patients over night. In this study we investigate the feasibility and usability of a system to collect physiologic and subjective information from heart failure patients, in their homes, at night. Then we assess clinicians' perceptions of usability of a system to display information constructed from the collected data. We anticipate that this electronic display will demonstrate above average usability.

Conclusion: This study is a first step toward developing an understanding of nocturnal heart failure in home-dwelling patients and methods to capture reliable physiologic and subjective data. We believe that this system will, in the future provide valuable information for clinicians to improve their management of heart failure patients.

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Information Practices and Information Systems in Home Health Care: A Field-Study



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In line with the general development in health care an increasing number of people receive health care in their homes. Caring for patients in their homes requires that providers have systems that collaborate with other providers, with access to relevant, accurate, up-dated and situation specific information. To enhance quality of care and efficiency in collaboration of services, the use of appropriate health information technologies (HIT) is frequently suggested as a solution.¹ In addition different types of collaborative processes must be supported by different technologies in order to provide proper support to the work. Most studies which have investigated health care information practices have been conducted in hospitals.²⁻⁵ We have not identified studies exploring home care nurses' information practices in-depth. The aim of this presentation is to report from an ongoing study aimed to explore home care nurses' information practices including their collaborators in the different situations and available information.

Methods: A field study using observations, individual and group interviews were conducted. The entire material contains totally 97 observations and 23 interviews with nurses in two Norwegian municipalities. A conceptual framework building on a practice typology guided the overall study design. The typology describes that nursing care could be separated within four different practice situations; acute situations, problematic situations, non-problematic situations, and problem identifying situations. Each of the practice situations has their own distinct characteristics, though they are not mutually exclusive categories.⁶ An integrative analytical approach was used to analyze the collected data.

Results: The analysis revealed that practice situations in home health care are characterized along two different but inter-dependent axes regarding the nurses' information needs. Firstly, patient related axes representing a continuum from acute to long term care situations. The second axes concerns organizational factors representing a continuum from where the nurses collaborated with other providers in a particular situation in a limited time and space, to practice situations which required long-time interdisciplinary and inter-organizational coordination and information. The home care nurses did not always have access to relevant situation specific information in the different practice situations. This was partly due to lack in their HIT system and partly due to gaps between providers in different levels of the health care system. The two different municipalities had different HIT systems. Both systems had their advantages but also shortcomings for covering the nurses' information and collaboration situations.

Discussion: The findings illustrate that home care nurses need to manage different information situations. They are not guaranteed accurate information at point of care in every situation. Their HIT systems are not developed at a level of meeting the plurality and complexity of practice and information situations. However, the findings from the current study may be helpful towards a more systematized development of feasible and appropriate HIT.

Conclusion: The study highlights the need for developing more appropriate and accurate HIT-systems for ensuring quality and safe health care for patients at home.

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