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Homecare Nurses' Decision-Making Information Needs During Admission

Paulina Sockolow, Ellen J. Bass, Kathryn H Bowles, Carl Eberle

THE re-hospitalization rate of homecare patients within 60 days of hospital discharge is 30%; enhanced care planning and allocation of clinical care services based on better information may reduce this rate. Understanding information needs and enhancing clinical decision-making during the admission care-planning process may assist homecare nurses to overcome the challenges of timely and appropriate allocation of clinical resources during the admission process and to reduce adverse events and hospital readmissions from homecare. While health information technology (HIT) has the potential to support the admission process, thereby improving quality of care while minimizing risk and harm to patients, contextual factors (e.g., workflow integration, HIT usability) present challenges to HIT implementation and adoption. To better understand the admitting nurse's information needs, we need to understand how clinical work is and could be done. Human factors methods aid in such understanding including how context affects both work processes and information needs. The study objective was to assess the feasibility of the use of selected human factors methods to examine care plan decision making during the homecare admission process.

Methods: During the first admission visits for two different patients, we observed one nurse who supported a homecare agency serving marginalized low income patients. Data collection methods included: observation of the nurse admitting a patient, observation of the nurse completing the admission documentation, and structured interview. In the home, types of data collected included: 1) nurse/patient conversations; 2) nurse access of paper artifacts; and 3) notes taken by the nurse. At the agency, the nurse was also audio recorded when not calling other healthcare providers. We copied de-identified physical documentation and reviewed the nurse's electronic product. Following documentation completion, we audio recorded a structured knowledge elicitation session coupled with clarifying questions. In addition, we interviewed agency experts to clarify issues related to HIT usage and nurse procedures. A researcher transcribed the field notes and audio recordings; we conducted content analysis of the transcribed documents to identify data related to nurse decision making.

Results: We focused on admission nurse decision-making of the patient problems to be addressed in the plan of care (POC), the non-nursing resources to be consulted (i.e., physical therapy, social work), and the nursing visit pattern (i.e., frequency of subsequent visits). The nurse referred to the patient problems and other contributing conditions identified in the hospital discharge and/or the physician homecare referral documentation. The nurse identified specific criteria for inclusion: problems that concerned the nurse; keeping the patient safe; pain management; and fall risks if there were many steps in the home. The EHR assisted POC development related to identification of interventions for each problem. Following nurse documentation of the assessment, the EHR presented a standard set of patient problems. The nurse selected a POC problem which triggered the display of a pathway which had decision branches that the nurse traversed as she selected POC interventions. Nurse identification of resources and selection of visit patterns was not assisted by the EHR. Resource decisions were prompted as the nurse reviewed the patient assessment, surveyed the patient's home environment, and as the patient raised concerns. When the nurse identified that the patient had a challenge that could be addressed by a non-nursing resource, she explained to the patient the intended benefit of the resource on the patient's condition. She then asked the patient if he/she would like the resource to visit him/her (i.e., shared decision making). The nurse explained that a visit pattern decision to schedule the return visit the next day was based on the patient's needing assistance within 48 hours. Subsequently, agency experts explained additional reasons for scheduling the first follow-up visit for the next day were if the nurse detected presence of symptoms or needed to demonstrate a nursing procedure to the patient or caregiver. Agency experts stated that more visits are scheduled at the start of the home care episode compared to the end of the episode as per the best practice guidelines for transitions in care. In addition to the admission visit, the nurse was observed to have scheduled two more visits for the first week for both patients and to schedule two visits for the second week for one patient.

Discussion: We conducted a pilot study to assess the feasibility of the use of selected human factors methods in preparation for a larger study that will investigate clinical decision making during homecare admission. Previous studies suggested that it was not clear how a nurse determined which problems identified in the assessment should be included/prioritized in the POC. Use of these methods did identify nurse decision making related to selection of the POC problems, nonnursing resources, and the nursing visit pattern. Our findings indicated that the study's EHR did not assist the nurse in these decisions. These pilot study results indicate that the methods used are appropriate for the larger planned study.

Conclusion: This study will inform the design of a larger study to identify improvements in homecare HIT systems that may reduce unplanned hospitalization readmission events. Study findings will also inform future HIT interventions related to transitions in care to and from homecare, such as Meaningful Use and clinical information exchange standards.

Leveraging Public Data to Investigate Home Care Quality in Urban and Rural America

H3IT

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As publicly available health-related data increase, it becomes possible to leverage such data to derive information which can support various decisions for improving the quality of home care delivered in the United States (US). In this respect, an important concern is to ensure that patients who live in the rural areas of the US will have equal access to quality home care just as those in urban areas. While a number of challenges for rural home care such as staffing and transportation can be easily recognized, the urban-versus-rural variations in home care quality have not been sufficiently investigated so far.[1] Understanding such variations is important for leveraging health IT purposefully, effectively, and efficiently for specific quality improvement targets in urban and rural HHAs. By leveraging heterogeneous data from disparate public repositories, this study investigated the variations in clinical process, clinical outcome, and utilization outcome measures that belong to urban and rural HHAs.

Methods: For quality measures, HHA-level data were obtained from the Medicare Home Health Compare Database (MHHC)[2] for 2014 which included (i) thirteen process measures, each showing the rate of adherence with a clinical practice, (ii) seven outcome measures, each showing the rate of improvement for a clinical outcome, and (iii) two utilization outcome measures, the rate of hospital admissions and the rate of emergency room visits not resulting in an admission. For each HHA, based on its zipcode, a Rural Urban Area Commuting Code (RUCA) was obtained from the University of Washington (UW).[3] Using the Categorization Scheme C[4] suggested by UW, each HHA was categorized as eitherurban or rural. To further enrich our results, we also obtained socio-economic status (SES) and agency characteristics data for each HHA. As a proxy for SES, we obtained median incomes corresponding to HHA zipcodes from the Population Studies Center at the University of Michigan.[5] As HHA characteristics, age data was obtained from MHCC in years; patient and visit counts for 2014 were used as proxy measures for HHA size, which were obtained from the Healthcare Cost Report Information System (HCRIS) Database.[6] The data set excluded the private-duty HHAs or those reimbursed by local governments under Medicaid. Consequently, there were two samples for each measure or characteristic, one for urban and other for rural HHAs. When the compared samples had normal distributions, we used t-test for comparison; otherwise, we used the Wilcoxon-rank sum test.[7] In addition to statistical significance, we also calculated Cohen's d for t-test and Cohen's r for Wilcoxon test[8] to understand the effect sizes, which in this case represent the magnitudes of the difference between the means of two samples. As typically done, we converted d values to r to use a single measure for the magnitude of differences across different tests.[9,10] Smaller r values do matter since the quality measures represent rates of care episodes.

Results: For brevity, we mention only the test results significant at p=.01 along with the r values in parentheses. When clinical process measures were compared, rural HHAs were better at starting care in a timely manner (.04), checking for flu shots (.03), determining whether pneumococcal vaccine was received (.10), and checking for the risk of developing pressure sores (.03). Urban HHAs were better at teaching patients about drugs (.07), checking for fall risks (.04), providing foot care for diabetic patients (.04), treating pain (.05), and taking doctor-ordered action to prevent pressure sores (.01). In terms of clinical outcomes, patients of rural HHAs had more improvement in getting in and out of bed (.06) and taking drugs correctly by mouth (.03). Regarding the utilization outcomes, urban HHAs had better hospital admission (.16) and non-admitted ER visit rates (.27).

Discussion: While there is plenty of room for improvement for both urban and rural HHAs, our results dispel the myth that rural home care is worse in terms of clinical processes and outcomes. When we perform comparisons on HHA characteristics, it seems that rural HHAs are older (.36) and they work hard; they have more patients (.09), and they make more visits (.08). Still, rural HHAs are better in four clinical process measures and perhaps not any worse in four process measures for which the test results did not show any statistical difference; they are better in two clinical outcome measures and perhaps not any worse in three others. However, regarding utilization outcomes, urban HHAs seem to be clear winners. Why is it so? It is possible that the clinical processes at which urban HHAs perform better improve the utilization outcomes more. It is also possible that clinical process and outcome measures do not provide a complete story: We note that median income is higher where urban HHAs serve (.39) pointing to higher SES levels. It is a plausible conjecture that communities with lower SES have worse health to start with, lower health literacy levels, and educational shortcomings. There may be also be geographic isolation and limited access to community resources.[11,12] There is already some evidence that rural residents generally have more annual hospital admissions than their urban counterparts.[13]

Conclusion: Urban and rural HHAs have different strengths and weaknesses in quality of care. Therefore, health IT decisions

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about the selection, purchase, and customization of various solutions, can be tailored to address different priorities in urban and rural HHAs. For example, urban HHAs could focus on timely start of care while rural HHAs focus on teaching patients about drugs via health IT adoption. Finally, it seems that the infrastructure investments made to publicize health-related data are paying off by leading to reproducible results such as those reported in this study.

References

1. McCann, M, Grundy, E, and O'Reilly, D. Urban and rural differences in risk of admission to a care home: A census-based follow-up study. Health & place 2014;30:171–176.

2. Find and compare Home Health Agencies | Home Health Compare. URL: `https://www.medicare.gov/homehealthcompare/search.html`.

3. UW RHRC Rural Urban Commuting Area Codes - RUCA. URL: `http://depts.washington.edu/uwruca/`.

4. Rural Urban Commuting Area Codes Data. URL: `http://depts.washington.edu/uwruca/ruca-uses.php`.

5. Zip Code Characteristics: Mean and Median Household Income. URL: `http://www.psc.isr.umich.edu/dis/census/Features/tract2zip/`.

6. Cost Reports - Centers for Medicare & Medicaid Services. URL: `https://www.cms.gov/Research-Statistics-Data-and-Systems/Downloadable-Public-Use-Files/Cost-Reports/`.

7. Nachar, N. The Mann-Whitney U: A test for assessing whether two independent samples come from the same distribution. Tutorials in Quantitative Methods for Psychology 2008;4:13–20.

8. Cohen, J. Statistical Power Analysis for the Behavioral SciencesNew JerseyLawrence Erlbaum Associates. Inc. Publishers 1988.

9. Borenstein, M, Hedges, L, Higgins, J, and Rothstein, H. Introduction to Meta-Analysis. Chapter 7. Converting Among Effect Sizes. 2009.

10. Fritz, CO, Morris, PE, and Richler, JJ. Effect size estimates: current use, calculations, and interpretation. Journal of experimental psychology: General 2012;141:2.

11. Boucher, MA. "Making it": qualities needed for rural home care nursing. Home Healthcare Now 2005;23:103–108.

12. Jones, CA. Health status and health care access of farm and rural populations. 57. DIANE Publishing, 2009.

13. Reschovsky, JD and Staiti, AB. Access and quality: does rural America lag behind? Health Affairs 2005;24:1128–1139.

Using Electronic Case Summaries to Elicit Multi-Disciplinary Expert Knowledge about Referrals to Post-Acute Care

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ELICITING knowledge from a large number of geographically dispersed clinical experts given their time and scheduling constraints, while maintaining anonymity among them, presents multiple challenges. Objectives: 1)To describe a four step, innovative Internet based knowledge elicitation method to acquire interprofessional experts' knowledge about which patients need post-acute referral. 2)To compare the percentage of patients referred by experts after case study review to the percentage of patients referred by hospital clinicians and to compare the experts' referral decisions by discipline and geographic region.

Methods: De-identified case studies, developed from the electronic health records (EHR) from six hospitals, contained a comprehensive description of 1,496 acute care inpatients. Clinical experts, with at least 5 years of clinical experience with older adults in discharge planning, post-acute, or transitional care were recruited from among professional colleagues of the team members, professional organizations, and snowball sampling, In teams of three, physicians, nurses, social workers, and physical therapists judged the case studies for the need for post-acute care referrals such as home care in a four step Internet based process followed by Delphi rounds when the team did not agree. Delphi rounds were also online and allowed sharing of information and asynchronous communication. We compared the referral decisions of the experts to each other, their regions, and the actual documented discharge dispositions made on the same cases by practicing clinicians at the hospital sites.

Results: Thirty-two physicians, 47 nurses, 44 social workers and 48 physical therapists completed the study. Twenty-nine percent were from the East, 26% from the Midwest, 19% from the West and 26% from the Southern regions of the United States. It took the experts 5-10 minutes per case to make their decisions. Experts recommended referral for 1,204 cases (80%) and not to refer for 292 (20%). Two hundred- eighty cases (18.7%) required one Delphi Round and 105 (7%) required two Delphi rounds to reach consensus on the site of care. In the end, 37% were recommended for skilled nursing facility care, 36.5% were recommended for home care services, 11% for inpatient rehabilitation, 8.5% for nursing home care, 5.5% for hospice, and 1.4% were unable to reach agreement at the end of two Delphi rounds and were not used in the modeling of the decision support algorithm. The experts demonstrated no significant differences in their decisions to refer patients for post-acute care based on their profession or regional location and there were no significant differences in the site of referral by discipline or region. The experts recommended referral for 80% of the cases while the actual discharge disposition of the patients collected from the hospital sites showed post-acute referrals for 65.9%.

Discussion: Experts given the time and comprehensive information to evaluate patients' need for post-acute care referred more patients for service than practicing clinicians. The methodology worked well for capturing the experts' decisions and provided enough information and a means to achieve agreement among multiple disciplines. The method elicited the independent (patient characteristics that are important) and the dependent variables (yes/no refer and to what setting) for subsequent modeling to build decision support tools.

Conclusion: The Internet based method for eliciting expert knowledge enabled expert clinicians to review case summaries and make decisions about post-acute care referrals. Having a case summary of comprehensive patient assessment information may have assisted experts to identify more patients in need of post-acute care compared to the number the hospital clinicians actually referred. The methodology produced the data needed to develop an expert decision support system for discharge planning. It is recommended as an effective method to elicit knowledge for building expert decision support.

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Using Natural Language Processing to Automatically Identify Wound Information in Narrative Clinical Notes: Application Development and Testing.

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T HIS study developed and validated one of the first automated natural language processing (NLP) applications to extract wound information (wound type, pressure ulcer stage, wound size, anatomic location, and wound treatment) from free text clinical notes.

Methods: First, two human annotators manually reviewed a purposeful training sample (n=360) and random test sample (n=1,100) of clinical notes (including 50% discharge summaries and 50% outpatient notes, including homecare notes), identified wound cases, and created a gold standard dataset. We then trained and tested our NLP system (known as MTERMS) to process the wound information. Finally, we assessed our automated approach by comparing system-generated findings against the gold standard. We also compared the prevalence of wound cases identified from free-text data with coded diagnoses in the structured data.

Results: The testing dataset included 101 notes (9.2%) with wound information. The overall system performance was good (F-measure =92.7%), with best results for wound treatment (F-measure =95.7%) and poorest results for wound size (F-measure =81.9%). Only 46.5% of wound notes had a structured code for a wound diagnosis.

Conclusion: The NLP system achieved good performance on a subset of randomly selected discharge summaries and outpatient notes. In more than half of the wound notes, there were no coded wound diagnoses, a fact that highlights the significance of using NLP to enrich clinical decision making. Our future steps will include expansion of the application's information coverage to other relevant wound factors and validation of the model with external data. We are also conducting a validation and further system development with homecare notes from the Visiting Nurse Services of New-York and will share the results at the H3IT conference.

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Assessing Commercially Available Personal Health Records Using a Standard Transition From Hospital to Skilled Home Health Care

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OLDER adults transitioning from acute care to home health face many challenges with continuity of care. The Haggerty et al. framework breaks continuity of care into three different areas: informational continuity, management continuity, and interpersonal continuity.[1] Informational continuity between home health and other health professionals is often attempted through incomplete, providerPcentered verbal and written documents that leave patients and/or families out of the discussions.[2] Home health differs from other care environments due to the increased demand on patients and caregivers to provide selfPcare, and the significant patient education needed to become proficient at home care tasks.[3] Previous research suggests that older adults may fail to effectively recall and share the necessary health information with their clinical providers.[4] As shown in community dwelling environments better coordination, organization, and knowledge of their medical condition may be possible through personal health records (PHRs).[5] The Markle Foundation describes a personal health record as "an electronic application through which individuals can access, manage, and share their health information in a private, secure, and confidential environment".[6] Our study aims to analyze commercially available PHRs for their suitability to accept, manage, and share data generated from a standard home health case study.

Methods: Two researchers independently reviewed the eighteen noPcost, webPbased PHRs listed on MyPHR.com.[7] Both researchers attempted to create an account for each of the systems, and enter, manage, and share information from a standard published case study detailing a 58 year old man referred to home health after an acute care episode.[8] The data from the case study were abstracted into four categories: demographics, medical history, acute care encounter, and home health visits. After independent review, the authors met to resolve any differences from the data collection and qualitatively describe the personal health records.

Results: Of the initial eighteen PHRs reviewed, one was unable to be found through Internet searches and ten were excluded.[9–18] The reviewers were able to enter most of the demographic information into all seven PHRs. The exception was that only three of the seven PHRs were able to accept the occupational therapy data.[9–21] Comprehensive medical history information could be entered into six of the systems.[22–24] One system only allowed users to upload PDF documents for medical history data. Four systems used structured lists to support data entry for medical conditions.[22–25] This functionality caused difficulties when trying to enter exact medical condition wording. Clinical data such as provider notes, echocardiogram results, and chief complaints from an emergency department visit could not be entered directly into any of the systems. Six of the seven systems allowed the user to upload documents from clinical encounters in formats that ranged from the portable document format (PDF) to the continuity of care document standard (CCD). One system could incorporate data from a CCD into the PHR. Three PHRs offered both a graph and table format of patient reported daily weight values. One system allowed users to update a dose in an existing medication entry, while keeping a record of the previous dosage in the system. The remaining systems required the user to discontinue a medication and create a new entry to update dosage.[24,25] Six of the systems allowed the user to view a discontinued medications list. All PHRs offered a way to export data in the medical record. Four only provided printerPfriendly formats, three provided CCD/CPCDA/CCR downloads ,[19,21,23] one provided a "Blue Button" format,[19] one provided a "PHR extract" in the form of XML document,[19] and one PHR allowed users to download a HTML format .[23] In addition, although not formally assessed, the reviewers found significant usability problems when navigating the systems.

Discussion: Although the seven PHRs reviewed could store critical data from the case study, the format and location of the data varied greatly between the systems. Most systems did not provide the functionality to effectively import data from other systems. Therefore the burden of incorporating data from clinical encounters would be significant for anyone with data from multiple clinical visits. In addition, the systems lacked the ability to associate data elements from a single clinical encounter, making it difficult to view and make sense of all of the changes to the record occurring from one episode. Finally, usability issues caused difficulties in tracking, updating, and managing historical medication lists. This was especially problematic when dosage, duration, or timing changes were made to existing medications.

Conclusion: More work is needed to ensure that PHRs are designed to help older adults longitudinally manage their clinical

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information. Older adults are expected to interact more with clinical providers as they age. Therefore the systems designed to store, manage, and share data generated from these visits will need to be able to accept and transmit data without a heavy burden on the user. Currently the noPcost, webPbased PHR's that we reviewed do not effectively support users with entering, managing, and sharing data from these encounters.

References

1. Haggerty, JL, Reid, RJ, Freeman, GK, Starfield, BH, Adair, CE, and McKendry, R. Continuity of care: a multidisciplinary review. BMJ: British Medical Journal 2003;327:1219.

2. Olsen, R, Hellzén, O, Skotnes, L, and Enmarker, I. Breakdown in informational continuity of care during hospitalization of older home-living patients: A case study. International journal of integrated care 2014;14.

3. Ellenbecker, CH, Samia, L, Cushman, MJ, and Alster, K. Patient safety and quality in home health care. 2008.

4. Kessels, RP. Patients' memory for medical information. Journal of the Royal Society of Medicine 2003;96:219–222.

5. Woods, SS, Schwartz, E, Tuepker, A, Press, NA, Nazi, KM, Turvey, CL, and Nichol, WP. Patient experiences with full electronic access to health records and clinical notes through the My HealtheVet Personal Health Record Pilot: qualitative study. Journal of medical Internet research 2013;15:e65.

6. Group, PHW et al. The personal health working group final report. Washington, DC: Connecting for Health: A Public-Private Collaborative 2003.

7. Millerick, Y. Pharmacological Treatment for Chronic Heart Failure: A Specialist Nurse Perspective. In: *Improving Outcomes in Chronic Heart Failure*. BMJ Publishing Group, 2007:163–183. DOI: 10.1002/9780470750551.ch9. URL: http://dx.doi.org/10.1002/9780470750551.ch9.

8. www.myphr.com. http://www.myphr.com/. (Accessed on 07/15/2015). Chicago, IL, 2015.

9. Personal Health Record. http://www.medemphr.mymedfusion.com/. (Accessed on 07/15/2015). Mountain View, CA, 2015.

10. phr.emrystick.com. http://phr.emrystick.com/. (Accessed on 07/15/2015). 2015.

11. MiVIA - Connecting Patients and Clinicians Nationwide. https://www.mivia.org/. (Accessed on 07/15/2015). Sonoma, CA, 2015.

12. myHealthFolders – Welcome. https://myhealthfolders.com/mhf/welcome.htm. (Accessed on 07/15/2015). St. Louis, MO, 2015.

13. Froedtert MyChart - Login - Milwaukee, Wis. https://www.mychartlink.com/MyChart/. (Accessed on 07/15/2015). Verona, WI, 2015.

14. ZebraHealth: ZebraHealth Inc. https://www.zebrahealth.com/. (Accessed on 07/15/2015). Kirkland, WA, 2015.

15. About My Health: Experience. Learn. Share. (Accessed on 07/15/2015). Nottingham, UK, 2015.

16. MedicAlert Foundation. http://www.aboutmyhealth.org/. (Accessed on 07/15/2015). Turlock, CA, 2015.

17. dLife - For Your Diabetes Life | Diabetes | Type 1 Diabetes | Type 2 Diabetes. http://www.dlife.com/. (Accessed on 07/15/2015). 2015.

18. Get Your Personal Health Record Now | Zweena Health. http://zweenahealth.com/. (Accessed on 07/15/2015). Hopewell, NJ, 2015.

19. NoMoreClipboard Connecting Patients and Providers. https://www.nomoreclipboard.com/. (Accessed on 07/15/2015). Fort Wayne, IN, 2015.

20. Healthspek - Free, Easy to Use Personal Health Records (PHR) App, Apple Rating 4.5 Stars. https://www.healthspek.com/. (Accessed on 07/15/2015). 2015.

21. MyMedWall. https://secure.mymedwall.com/phr/. (Accessed on 07/15/2015). 2015.

22. Health Companion, Inc. https://www.healthcompanion.com. (Accessed on 07/15/2015). San Diego, CA, 2015.

23. Microsoft HealthVault. https://www.healthvault.com/en-us/. (Accessed on 07/15/2015). Redmond, WA, 2015.

24. Doclopedia Marketplace Development. https://www.doclopedia.com/. (Accessed on 07/15/2015). Phoenix, AZ, 2015.

25. eHealth - RememberItNow. http://www.rememberitnow.com/index.php. (Accessed on 07/15/2015). Orinda, CA, 2015.

Identifying Home Care Providers' Information Needs for Managing and Reducing Fall Risks

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F ALLS are the leading cause of home injuries for older adults,[1–3] often cause hospital admissions,[4] and are costly.[5] In 2013, more than \$34 billion was spent as a direct medical cost for falls.[6] In home care, the Centers for Medicare and Medicaid Services (CMS) reports that, injuries from falls contributed to unplanned ER visits and ranked as the highest amongst potentially avoidable events (PAEs).[7] PAEs reflect a serious health condition or decline in health status for a patient that potentially could have been avoided while the patient was under care at a home health agency (HHA).[8] Unfortunately, home care providers often start the episode of care devoid of information[9] critical to fall risk management and quality care. This study aims to (i) identify information needs of home care provider, (ii) classify them, (iii) and identify gaps in existing workflows as they relate to managing and reducing the risk falls.

Methods: A qualitative research approach was preferred as it allowed the research team to obtain rich and context-specific information.[10–12] A detailed and rich literature review on the topic was conducted initially. Data from three branches of a Maryland HHA were collected through: (a) direct observations (n=6), (b) face-to-face focus groups (n=22), (c) a face-to-face meeting (n=19), and (d) semi-structured interviews (n=20) sequentially. Participants included, nurses, physical and occupational therapists, home aides, care transition employees, managerial staff, and health IT administrators. The Framework Method was used for the analysis of the results.[12,13]

Results: Broadly, information needs of home care providers were clinical and non-clinical in nature. These needs were categorized into four main domains: (i) clinical, (ii) educational, (iii) social, and (iv) administrative. Overall, home care providers had similar information needs, but emphasis on the required information varied based on discipline. There was general agreement amongst providers on the importance of having a brief history of the patient and their journey throughout the healthcare system. When asked about important information needed for managing falls, one home care nurse notes that "There are a lot of information that referral sources doesn't give us, we just have to do our own investigation". Home care providers deal with inconsistent data about their patients; often times the information in the HHA's electronic health record (EHR) and printed hospital discharge record are different. A physical therapist states: "What is an issue is been able to get the same information, that's available for a patient when they are in the hospital." Specifically for falls, a clinical supervisor notes that "The biggest complaint I get from the therapists is weight bearing status being inaccurate and that's a big problem." Not knowing the weight bearing status of a patient can potentially lead to harm during and after a home visit. Often medical orders are imprecise; "The orders are often just so vague." Specifically for fall risk management, prior rehabilitation notes, are extremely helpful to evaluate a patient's fall risk; "Did they go to rehab. If they did, I would read some of the therapy notes from the rehab. that is really helpful to know." Additionally, due to the nature of home care and the provider's inability to continuously monitor the patient for falls, it is important to know "Who they live with and availability of caregivers and willingness of those caregivers." Information gaps were attributed to (a) the HHA not being part of a local/state Health Information Exchange (HIE), (b) no integration or information exchange between HHA or hospital system, or (c) the HHA intake staff did not pass through the required information.

Discussion: Our results concur with earlier studies that home care episodes remain devoid of important information that informs the plan of care.[9] Our study provides specific evidence to HHAs and reports on essential data required to better manage and reduce the risk of falls. Breaks in the information flow, as well as incompleteness in the exchanged information for fall risk management, creates gaps in the continuity of care and challenge home care providers.[14] Important non-clinical and contextual information is critical to personalized medicine, care workflows, and safer care practices in home health; having such information helps providers tailor their care to better manage and reduce the risk of falls. Having a correct address and contact information of the patient and their care giver can improve providers' utilization of time and direct their attention to better care for their patients. While some information might be assumed to be available and error-free, providers often find themselves "Making sure that the addresses are correct. Making sure that the physicians that they have in the system are the ones that are going to be following the patients." Our results also confirm that the focus of exchanged and documented information is on the clinical condition,[15] however, information in the educational and social domains such as patient preferences, culture, and psychosocial state, are rarely exchanged in either written or electronic formats; it remains in the memory of providers.[16] To date, fax and phone remain the predominate mode of exchanging health information. Currently, EHRs, HIEs, and information flows are fragmented, disconnected and do not allow for full capturing of important contextual information. Better integration and exchange of information between EHRs, participation in HIEs, and designing

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health IT solutions capable capturing non-clinical and contextual information can help close these gaps.

Conclusion: Evidence from this study highlights essential information for managing and reducing fall risk and categorizes them into four domains. Results highlight the importance of capturing essential information, both clinical and non-clinical, throughout the patient's journey to and in home care. Without understanding the information needs of home care providers, improvement opportunities to manage and reduce falls will not be realized.

References

1. Stevens, JA, Corso, PS, Finkelstein, EA, and Miller, TR. The costs of fatal and non-fatal falls among older adults. Injury prevention 2006;12:290–295.

2. Lord, SR, Menz, HB, and Sherrington, C. Home environment risk factors for falls in older people and the efficacy of home modifications. Age and ageing 2006;35:55–59.

3. Titler, M, Dochterman, J, Picone, DM, Everett, L, et al. Cost of hospital care for elderly at risk of falling. Nursing Economics 2005;23:290.

4. Health, F of. Preventing hospital readmissions and loss of functional ability in high risk older adults. corporate 2011.

5. Centers for Disease Control. Cost of Fall Injuries in Older Persons. URL: `https://www.cdc.gov/homeandrecreationalsafety/Falls/data/cost-estimates.html`.

6. Costs of Falls Among Older Adults | Home and Recreational Safety | CDC Injury Center. URL: `https://www.cdc.gov/homeandrecreationalsafety/falls/fallcost.html`.

7. OASIS C Based Home Health Agency Patient Outcome, Process and Potentially Avoidable Event Reports - Centers for Medicare & Medicaid Services. URL: `https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/OASIS/09aa_hhareports.html`.

8. Centers for Medicare and Medicaid Services. Outcome-based quality monitoring (OBQM) manual. URL: `https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/HomeHealthQualityInits/downloads/hhqiobqmmanual.pdf`.

9. Bowles, KH, Pham, J, O'Connor, M, and Horowitz, DA. Information deficits in home care: A barrier to evidence-based disease management. Home Health Care Management & Practice 2010;22:278–285.

10. Kitzinger, J. Qualitative research. Introducing focus groups. BMJ: British medical journal 1995;311:299.

11. Parsons, M and Greenwood, J. A guide to the use of focus groups in health care research: Part 1. Contemporary Nurse 2000;9:169–180.

12. Ritchie, J and Spencer, L. Qualitative data analysis for applied policy research. The qualitative researcher's companion 2002;573:305–329.

13. Smith, J and Firth, J. Qualitative data analysis: the framework approach. Nurse researcher 2011;18:52–62.

14. Olsen, R, Hellzén, O, Skotnes, L, and Enmarker, I. Breakdown in informational continuity of care during hospitalization of older home-living patients: A case study. International journal of integrated care 2014;14.

15. Anderson, MA and Helms, L. Home health care referrals following hospital discharge: communication in health services delivery. Journal of Healthcare Management 1993;38:537.

16. Haggerty, JL, Reid, RJ, Freeman, GK, Starfield, BH, Adair, CE, and McKendry, R. Continuity of care: a multidisciplinary review. BMJ: British Medical Journal 2003;327:1219.

Informing Health IT Adoption Strategies in Home Care Through Identifying Key Performance Improvement Domains for Home Health Agencies

H3IT

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IMPROVING the quality of healthcare can result in better health outcomes and patient satisfaction while possibly reducing the overall costs of healthcare.[1] Historically, a number of initiatives were designed and implemented to improve the quality of home care in the United States.[2] In the future of home care, quality improvement efforts will continue to take an important role, and health information technology (IT) will be expected to effectively serve and support such efforts.[3–5] Recently, the Centers for Medicare and Medicaid Services (CMS) proposed a rule requiring home health agencies (HHAs) to design and implement quality assessment and performance improvement (QAPI) programs to fulfill the conditions of participation in Medicare.[6] CMS set the end goal as observable improvements in the quality measures without providing specific advice about how to improve outcomes through QAPI by acknowledging its difficulty. Instead, CMS advises HHAs to adopt customized QAPI programs by considering the specific needs and conditions of their organization and patient population. To support customized QAPI programs, this study investigated quality attributes for home care with an emphasis on Medicare HHAs. These quality attributes constitute key performance improvement domains (KPIDs), which can be used to view, characterize, and improve the performance of an HHA. Consequently, KPIDs can serve as useful tools in various discussions and brainstorming activities on how contextual improvement can be achieved and how health IT can be a vehicle for improvement.

Methods: A qualitative research approach was preferred to obtain contextual and rich data.[7–9] The Framework Method,[10–13] used in many research domains including, medicine,[14–16] was adopted. Qualitative data were collected via four focus group discussions with twenty home care domain experts. Focus groups were preferred due to their dynamic nature because they enable direct involvement of all participants, facilitate interactions and discussions, and potentially lead to consensus among participants.[17] The analysis results were further refined in an online forum and validated at a final meeting.

Results: From the focus group discussions, a well-defined set of 17 KPIDs emerged under four categories, namely, (i) Economical Value: 1) worthiness, 2) affordability; (ii) Sociocultural Sensitivity: 3) cultural competency, 4) socioeconomic awareness; (iii) Interpersonal Relationships: 5) fairness, 6) courtesy, 7) reliability, 8) expectation management; and (iv) Clinical Capabilities: 9) professional competency, 10) timeliness, 11) coordination, 12) completeness, 13) engagement, 14) standards conformance, 15) customizability, 16) monitorability, and 17) accountability. An example of a KPID in the Economical Value category is affordability; participants expressed that home care delivery costs must be controlled in order to make it feasible for patients and their payers(CMS), and to maintain the HHA's sustainability as a business. A participant commented that "Access to home care should not be hindered by ability to pay. The care should be both financially and geographically accessible" (participant 6). In the Sociocultural Sensitivity category, many participants indicated that home care staff should develop cultural awareness to respond to various cultural needs of patients and caregivers, including their religions and languages. A participant stated: "If unfamiliar with cultural preferences and customs, case manager should research before start of care then speak to patient and family" (participant 15). Participants also emphasized Interpersonal Relationships by considering that home care professionals should show courtesy towards patients and caregivers; as one participant explains: "Our care must be friendly and supportive" (participant 20).

Discussion: Results indicate that performance improvement in HHAs is a lot more complicated than simply assessing whether certain clinical tasks are performed. It is important for HHAs to develop a broader view of what should be done as part of the overall care delivery process; Only then can an HHA truly have an impact on patient outcomes. For example, given the nature of home care, attention to social and cultural issues is paramount to delivering patient-centered care. In addition, it is essential that there be sensitivity to socioeconomic status of patients, where they live, community resources, family and caregiver involvement, as well as social support systems. HHAs can evaluate their health IT adoption strategy and current solutions to assess if and how they help them improve any of the KPIDs. For example, to improve the professional competency of providers, health IT solutions should provide online and electronic training to enable providers to stay up-to-date on the latest evidence-based care practices.

Conclusion: KPIDs identified in this study can help HHAs in their customized QAPI initiatives by providing useful starting points. Through the identification of relevant domains, and important information required for quality improvement, health IT strategies can be better aligned with HHA QAPI activities. HHAs should evaluate their health IT adoption strategies

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in light of this evidence and decide whether their health IT solutions help them improve the previously-mentioned domains. Therefore, our results should be immediately relevant, intriguing, and applicable to the home care industry and policy makers. In the future, results from this study could lead to a framework for developing a set of performance measures for KPIDs. We recognize that before CMS or accreditation bodies require the KPID measures, there is more work that needs to be done to validate whether the measures do have an impact on patient outcomes.

References

1. Berwick, DM, Nolan, TW, and Whittington, J. The triple aim: care, health, and cost. Health affairs 2008;27:759–769.

2. Rosati, RJ. The history of quality measurement in home health care. Clinics in geriatric medicine 2009;25:121–134.

3. Casalino, L, Gillies, RR, Shortell, SM, et al. External incentives, information technology, and organized processes to improve health care quality for patients with chronic diseases. Jama 2003;289:434–441.

4. Russell, D, Rosenfeld, P, Ames, S, and Rosati, RJ. Using technology to enhance the quality of home health care: Three case studies of health information technology initiatives at the Visiting Nurse Service of New York. Journal for Healthcare Quality 2010;32:22–29.

5. Bowles, KH, Dykes, P, and Demiris, G. The use of health information technology to improve care and outcomes for older adults. Research in gerontological nursing 2015;8:5–10.

6. Health, UD of, Services, H, et al. Centers for Medicare and Medicaid Services (CMS) Medicare Carriers Manual.

7. Kitzinger, J. Qualitative research. Introducing focus groups. BMJ: British medical journal 1995;311:299.

8. Parsons, M and Greenwood, J. A guide to the use of focus groups in health care research: Part 1. Contemporary Nurse 2000;9:169–180.

9. Creswell, JW. Qualitative inquiry and research design: Choosing among five approaches. Sage publications, 2012.

10. Ritchie, J and Spencer, L. Qualitative data analysis for applied policy research. The qualitative researcher's companion 2002;573:305–329.

11. Ritchie, J, Lewis, J, Nicholls, CM, Ormston, R, et al. Qualitative research practice: A guide for social science students and researchers. Sage, 2013.

12. Smith, J and Firth, J. Qualitative data analysis: the framework approach. Nurse researcher 2011;18:52–62.

13. Srivastava, A and Thomson, SB. Framework analysis: a qualitative methodology for applied policy research. 2009.

14. Read, S, Ashman, M, Scott, C, and Savage, J. Evaluation of the modern matron role in a sample of NHS trusts. Final Report to the Department of Health, The Royal College of Nursing Institute and The University of Sheffield School of Nursing and Midwifery, Sheffield and London, UK 2004.

15. Gerrish, K, Chau, R, Sobowale, A, and Birks, E. Bridging the language barrier: the use of interpreters in primary care nursing. Health & social care in the community 2004;12:407–413.

16. Emery, D, Cowan, A, Eaglestone, B, Heyes, B, Procter, P, and Willis, T. Care plus. Final report, The University of Sheffield 2002.

17. Pope, C, Royen, P van, and Baker, R. Qualitative methods in research on healthcare quality. Quality and Safety in Health Care 2002;11:148–152.

Evaluation of an Electronic Module for Reconciling Medications in Home Health Plans of Care

H₃IT

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URRENTLY home health referrals involve the exchange of paper documents between referring providers and home health agencies. In these exchanges medication lists are often manually annotated to address discrepancies between records. This manual process is error prone and inefficient, leading to ambiguities in the patient record and placing patients' safety at risk. In this project we developed an electronic medication reconciliation module that was integrated into a simulated EHR and intended for use by VA providers when managing plans of care returned by home health. We evaluated the effects of this module on the accuracy and efficiency of addressing medication discrepancies.

Methods: Nineteen physicians who had experience in managing home health referrals were recruited to participate in a within-subjects experiment. Participants completed two blocks of three clinical cases each. In each block of cases the first case was an orientation case, this was followed by two cases for which the data was used for analysis. The first block of cases (mixed paper/electronic) simulated current practice: reconcile medication discrepancies between a paper plan of care (CMS 485) returned form home health and a simulated electronic health record. For the second block of cases (medication reconciliation module) participants used the electronic only medication reconciliation module that was integrated into the simulated electronic health record. The order of the cases was randomized for each participant within these blocks Repeated measures ANOVA was used to test our hypotheses that the medication reconciliation module would improve accuracy of reconciliation, and decrease time to complete cases. Provider satisfaction was evaluated using a composite scale derived from a post experiment questionnaire. Participants also provided qualitative feedback regarding the design and functionality of the electronic tool.

Results: Participants left more discrepancies unaddressed in the mixed paper/electronic than when using the electronic only medication reconciliation module (1.5 vs. 0.45, F=21.9, p<0.0001), supporting our hypothesis that the electronic tool would improve reconciliation accuracy. However, individuals took the same amount of time to complete cases in each condition (258.7 vs. 260.4 seconds, F=0.01, P=0.92),this was contrary to our hypothesis that the electronic system would decrease time to complete cases. Based on participants' verbal feedback, we hypothesize that by providing assistance with the mechanics of reconciliation, the electronic only medication reconciliation module afforded participants 'found time' to forage in the record for information related to the appropriateness of medications. This post-hoc hypothesis was supported by examining the number of times participants switched between tabs in the mixed paper/electronic vs. electronic only medication reconciliation module conditions in the simulated EHR (7.2 vs. 15.3, F=12.4, P<0.0001). Finally the hypothesis that the medication reconciliation module would increase provider's satisfaction was supported by a mean score of 6.4/7 on the composite satisfaction scale and by the fact that 17/19 participants expressed a preference for the electronic only medication reconciliation module over the current mixed paper/electronic process.

Conclusion:We present an evaluation of an electronic medication reconciliation module integrated into the EHR. The system improved the accuracy and providers' satisfaction with medication reconciliation in home health plans of care. Further work, particularly in addressing our unexpected finding of increased searching of the EHR when using the medication reconciliation module, will be discussed.

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Using Telehealth to Reduce All-Cause 30-Day Hospital Readmissions among Heart Failure Patients

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OVER 5.7 million Americans aged 20 years or older suffer from heart failure (HF) with an expected increase of 46% by 2030. Hospital discharges with a primary diagnosis of HF rose from 877,000 in 1996 to 1,023,000 in 2010. Estimated total cost of HF in the United States exceeded $30 billion in 2012 and is projected to be $70 billion by 2030.[1] Heart failure is the primary diagnosis for 4.3% of home health episodes [2] and is among the top ten most common diagnoses related groups for Medicare beneficiaries discharged from an acute care setting to home health.[3] CMS implemented the Hospital Readmissions Reduction Program to reduce payment to hospitals with excess Medicare beneficiary 30-day readmissions for HF.[4] Approximately 25% of HF patients are readmitted to a hospital within 30 days of discharge[5] making the reduction of HF patient readmission rates a national priority. Prior research shows varied results on patient outcomes, however, a recent meta-analysis indicates TH reduces HF related hospital admissions compared to usual care.[6] This presentation will describe the launch of this program, how operations were centralized and future directions. Reducing 30-day readmissions was and continues to be a health system-wide objective.

Methods: A telehealth, remote monitoring program was initiated in September of 2010 at Penn Care at Home, a skilled home health agency affiliated with the University of Pennsylvania Health System. The TH program is intended to reduce HF patient readmission rates within the health system. Program processes were continually monitored and continue to evolve contributing to this program's success. Potential candidates have to speak English, be able to stand on a scale and be agreeable to TH. Initial equipment employed was moderate sized TH unit reliant upon a landline telephone or wireless card. In 2014 all TH equipment was converted to a 4G tablet based system collects patient vital signs and systems and is preloaded with patient education related to maintaining a healthy lifestyle and self-care (automated device-based). The software also includes instructional videos and individualized care plans. The recorded data is transmitted to the TH team, located within the health system's teleICU on a daily basis, who collaborate with patients and providers to identify goals and strategies to avoid a hospital readmission if possible. Data related to admissions is captured via the health system's electronic health record which alerts TH personnel. Nearly 200 patients receive TH each year.

Results: Year one all-cause 30 day readmission rate was 19.3% (fiscal year 2011-2012) among HF patients. Current rate is 5.2% (fiscal year 2014-2015), a reduction of over 14% in three years.

Discussion: TH was associated with reduced all-cause 30-day readmission among HF patients receiving skilled home health services. Vigilant clinicians and efficient processes, including collaboration with the health system's existing teleICU program, have contributed significantly to the programs' success. Limitations include only one home health agency, one health system and that efforts to reduce 30-day readmission was a health system-wide objective which could contribute to this programs success.

Conclusion: Penn Care at Home's all-cause 30-day readmission rate has steadily declined since the program's inception and has become an integral part of the University of Pennsylvania Health Systems' 30-day readmission reduction efforts.

References:

[1] Mozaffarian, D., Benjamin, E. J., Go, A. S., Arnett, D. K., Blaha, M. J., Cushman, M., ... Turner, M. B. (2015). Heart disease and stroke statistics—2015 update: A report from the American Heart Association. Retrieved from http://circ.ahajournals.org/content/early/2014/12/18.

[2] Caffrey, C., Sengupta, M. Moss, A., Harris-Kojetin, L. & Valverde, R. (2011). Home health care and discharge hospice care patients: United States, 2000 and 2007. National Health Statics Report, 38: 1-27.

[3] Centers for Medicare and Medicaid Services (2012). Chronic conditions among Medicare beneficiaries: Chartbook 2012. Retrieved from https://www.cms.gov/research-statistics-data-and-systems/statistics-trends-and-reports/chronic- con-

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[1]Penn Care at Home, University of Pennsylvania Health System
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[3]Infectious Diseases Division, Department of Medicine, University of Pennsylvania Perelman School of Medi

ditions/downloads/2012chartbook.pdf Medicare Payment and Advisory Commission (2013).

[4] Krumholz, H. M., Merrill, A. R., Schone, E. M., Schreiner, G. M., Chen, J., Bradley, E. H., ... Drye, E. E. (2009). Patterns of hospital performance in acute myocardial infarction and heart failure 30-day mortality and readmission. Circulation: Cardiovascular and Quality Outcomes, 2: 407-413.

[5] Kitsiou, S., Pare, G. & Jaana, M. (2015). Effects of home telemonitoring interventions on patients with chronic heart failure: An overview of systematic reviews. Journal of Medical Internet Research, 17(3):e63.

Achieving the Triple Aim of Health Care Reform: Current Initiatives & Trends in the United States

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THE Institute for Healthcare Improvement (IHI) developed the Triple Aim, a framework that describes an approach to optimizing health system performance. The framework has been widely adopted by thought leaders, policy makers, regulators, providers and payers as the United States strives to achieve health care reform. The framework consists of three dimensions: 1) improving the patient experience of care (including quality and satisfaction), 2) improving the health of populations, and 3) reducing the per capita cost of health care. This session will explore where we are trying to go, how we expect to get there and how long we expect this journey of heath care reform to take.

Specifically, we will examine the three dimensions of the Triple Aim by describing the value of improving the patient experience, the role of population-based health care in improving the overall health of our communities and country and the importance of lowering per capita costs. We will then pivot and take a look at specific examples that are currently happening on multiple fronts. These will include initiatives driven by health policy and regulation, examples of social and environmental awareness and incentives and public/private collaboratives. Each initiative on its own is designed to support and create improvement in our healthcare delivery and payment systems. Each initiative also includes a prescribed set of measures, an expectation for data collection and an analysis to determine their impact and contribution to success. When taken collectively these initiatives create clear and directionally positive momentum for change. Along with this change, comes opportunity for Home Healthcare and Hospice organizations to contribute to that success.

Lastly, we will discuss the expected time lines and levels of confidence that are designed to assist us in achieving meaningful change. Knowing and understanding these timelines will help the audience recognize the collective impact and convergence of these initiatives designed to support the desired future state of health and health care in the United States.

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Mobile Application Development in Real Time

H3IT

Shradha Aiyer, Lead, Mobile Application Development Team – Axxess
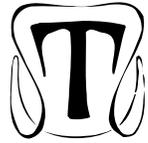
THE original Axxess company, Axxess Healthcare Consult, began in 2007, as a technology advisor/consultant for Home Health Agencies in Dallas, TX. The consulting company conducted performance reviews, enabled agencies to operate utilizing seamless processes, advised agencies during their formation, during their compliance surveys, and, served as an education/training provider as an accreditor for the American Nurses Credentialing Center (a division of the American Nurses Association), and as such, conducted training events for educational purposes. Home Health continues to be a business that requires immense learning challenges for its operators from a clinical quality, operational process and general regulatory standpoint. Axxess throughout its history has sought to address that difficult challenge with training and education tailored to the needs of home health professionals. In 2009, Axxess, through an in depth industry analysis, determined that a state-of-the-art Electronic Medical Record system, delivered from "the cloud", was unavailable in the home health (Medicare Certified Home Health) marketplace. Axxess Technology Solutions was formed to launch the software segment of the business, as a Software-as-a-Service, subscription-based business model, and after a year-and-a-half long development cycle, began its EMR solution, with a 4/15/2011 "go live" date. The Agencycore platform was built was built with Scalability, Redundancy, and Availability in mind using the Microsoft Visual Studio development environment, and operates in the .NET (Active Server Page/Java Script) environment. Scalability, Extensibility, Redundancy, and Availability are characteristics of the .NET development environment, as well as Sustainability into the future. The .NET Framework is a technology that supports building and running the "next generation" of applications and XML Web services. The .NET Framework is designed to fulfill the following objectives: To provide a consistent object-oriented programming environment whether object code is stored and executed locally, executed locally but Internet-distributed, or executed remotely. To provide a code-execution environment that minimizes software deployment and versioning conflicts. To provide a code-execution environment that promotes safe execution of code, including code created by an unknown or semi- trusted third party. To provide a code-execution environment that eliminates the performance problems of scripted or interpreted environments. To make the developer experience consistent across widely varying types of applications, such as Windows-based applications and Web-based applications. To build all communication on industry standards to ensure that code based on the .NET Framework can integrate with any other code. As our Agencycore platform began growing in number of users and features and functionality, it became obvious that a functional, integrated Mobile Application feature was necessary in order to facilitate the visiting clinician's ability to document all aspects of the patient's condition at the Point Of Care. Shortly after "go live", in early 2012, our mobile applications team began its work.

Methods: The Software Engineering team at Axxess evolved their software development process over the years since 2010. As the team grew so did our processes. Being a SaaS environment, we push enhancements and fixes rapidly, at least bi weekly. We have always followed the Agile – Scrum process for our development. This ensures rapid delivery to our customers. While other EMRs update their software platforms once every few months or quarterly, we push out new features at-least once a week. Initially, our software deployment process was a tedious and manual process. Now, using a continuous delivery process, we have automated our deployment process, which helps us with shipping more software features. Collaboration was key to our organic growth within the engineering team. We have refined our development process to enable seamless collaboration. As we expanded our product suite, we embraced team collaboration tools and moved away from physical scrum boards. Bug tracking, issue tracking, and project management tools are being employed to manage our work backlog. Although our team is divided into different product teams, everyone follows the same agile principles. This is at the core of our success as a software team.

Results: Our Axxess Mobile solutions currently focus on point of care. Anything a clinician needs to document at the patient's home, they will be able to using our Apps. Access to the software via Smart Phones and Tablets has enabled our clinicians to work more efficiently and spend more time on patient care, not paperwork. Axxess mobile app continues to be the first (and only) native mobile app that works on both platforms (iOS and Android) in home health. The Axxess Mobile App is unique in that it provides Electronic Visit Verification (EVV) - an accountability feature that uses GPS and automatic time stamps to track location and time of visit to the patient's home. This tool allows organizations to document proof of their organization's compliance and eliminate potential fraud charges by recording the date, time, and location while focusing on patient care. A clinician can collaborate with care-givers within their agency by sending HIPAA-complaint messages via the App. They can review patient information, and contact their patients ahead of their visits. They are able to navigate to the patient's home and plan their day better. While at the patient's home our clinicians have access to the patient's medication profile, Allergy profile, Pharmacies and Physicians associated with their patient. They can also reach out to emergency contacts and other caregivers actively treating their patient. Clinicians find that adding orders and

communications to the patient profile can be done in a jiffy with talk-to-text enabled data fields. In rural areas, Clinicians need to visit rural areas, our mobile apps let our users access information offline. To remain HIPAA-compliant and keep data secure, we use encryption techniques to secure mobile data even before it's uploaded to the server, ensuring that information is secure at every point. The code within our apps, itself, is obfuscate, that is, it only communicates with approved Axxess services (unlike other commercial apps that share data).

Discussion: There are many challenges facing engineers in our mobile app development team, including ongoing maintenance, on a week-to- week, and day-to-day basis. The world of enterprise apps can get extremely complicated with all the data thrown at the users. Being an Agile team, we continuously deliver useful features hence ensuring customer satisfaction. User Focused: People and interactions are emphasized rather than process and tools. Customers, developers and testers constantly interact with each other. User Friendly: Our approach to technology is all about making it user-friendly, helping home health provider clinicians (nurses, therapists and aids, who are not always comfortable with technology) seamlessly and painlessly employ technology to work smarter and more efficiently. Customer enhanced: To achieve this, we in engineering and other experts from the industry the sit down with real customers to understand firsthand what works, what can be improved and what is the next opportunity for innovation that raises the bar. Real Time Updates: From a business perspective, being Agile is extremely beneficial. Late changes in requirements are welcomed which ensures the best possible outcome. Working software is delivered frequently. Being Agile helps both Engineering and Business Development, as internal client focused partners, be more collaborative, tackling challenges in the ever-changing world of healthcare regulations. When you are agile, there is continuous attention to technical excellence and good design. We constantly monitor availability and usability of our software. Every room in Engineering has a screen with our current request ratios, server and database load. Within the mobile team we use Google, Apple and Fabric – analytics to monitor accessibility as well as our user device demographics. This helps better cater to our user's needs while monitoring industry trends within the mobile device space. As the mobile team develops features to work in unison with our web-based platforms, Agile can prove to be challenging at times. Mobile is always focused on rapid deliverables where as our web- based application requires maintainability updates as well as large features. When it comes to large deliverables it becomes difficult to assess effort required, in the beginning. This in turn can affect the timeline across platforms as they all pass through the same testing environment. Inter-dependencies of deliverables create challenging road blocks for our product managers. In Agile, designing and documentation happens as you go. This can cause misunderstandings between business requirements and implementation. Product Managers need have a clear understanding of our business as well as understand what technical effort is required to build features. At Axxess, we have addressed this potential issue of communication by employing Health-Care industry experts as Product Managers. They work closely with the project team leads to create meaningful sprints for business and engineering. People play an extremely important part in Agile development, within Axxess we have noticed a productivity decline when we move resources from one part of our development team to another. This is mainly due to each product being so unique. For example – Billing and Payroll for Home Healthcare(Medicare Certified/Clinical) vs. Private Pay. To help reduce these knowledge gaps we have Role-play sessions once a month, where members of the engineering team act and use our software as real customers would.

Conclusion: The development of native Mobile Apps for both Android and iOS systems is a challenging characteristic that has not been achieved by any other software company in the Home Health space. Most of our competitor software companies utilize a third party app development contractor to manage their app development tasks, if they have attempted to develop an app. This is problematic for them since outsourced developers rarely have an in-depth understanding of the industry. Our regular updates require our mobile app developers to remain fully utilized. Not only do we have to pay close attention to features and functionality for our client agencies, we must research our relative compliance with the evolving standards for Electronic Visit Verification across each of the United States. Our in- house counsel is researching the statutory requirements the states we serve (45 states so far). The key issue is whether the state has recognized GPS as an acceptable method for Visit Verification rather than twenty-year-old- plus CTI telephony integration technology. Looking forward, we realize the Home health industry is slightly behind the currently available technology but we also see the immense potential for innovation. With the advent of Wearable and Bluetooth enabled measurement devices for a patient's vital signs, as well as various patient movement related apps, Remote Patient Monitoring will become more achievable and cost-effective, from within the app. Mobile devices bring with them an array of features such as sensors, touch interaction, location awareness. Many of our future enhancements will take advantage of these features. We want to continue to harness this technology to provide innovative solutions for patients and Clinical and Functional practitioners in the industry.

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