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Do Errorless Methods Improve Discharge Medication Instruction and Adherence?

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Abstract

Purpose and Design: Postdischarge adverse drug events are a national issue, and effective inpatient instruction may help. Therefore, this intervention study examined whether using errorless teaching/learning methods including pictorial medication cards (ETL + card) improved RN teaching and patient medication adherence among persons with cognitive challenges (PWCCs).

Methods: Convenience samples of RNs and PWCCs from a 24-bed rehabilitation unit provided baseline data. RNs implemented ETL + card, and postintervention data were collected. Adapted and investigator-designed instruments had preliminary reliability/validity.

Findings: Postintervention RNs demonstrated more teaching strategies ($p = .003$), and teaching satisfaction rose from 0% to 50%. Minutes per teaching interaction were unchanged ($p > .05$). Baseline patients filled a higher number ($p = .02$) but a lower percentage (67%) of their prescriptions than did postintervention patients (85%). Medication dose adherence scores were unchanged ($p > .05$).

Conclusions: ETL + card improved RN teaching and possibly patient adherence. Further study is warranted.

Clinical Relevance: ETL + card may help PWCCs achieve safe medication self-management.

Keywords: Brain injury; discharge planning; errorless learning; nursing; teaching methods.

Introduction

Care transitions from hospital to home can be "dangerous" (Agency for Healthcare Research and Quality [AHRQ], 2018, para. 1) with postdischarge negative incidents occurring in up to 19% of patients. Of those negative incidents, adverse drug events (ADEs) are the most common (Forster, Murff, Peterson, Gandhi, & Bates, 2003). Nationally, ADEs account for roughly 125,000 hospital admissions, 1 million emergency department visits, and 3.5 million office visits annually (Office of Disease Prevention and Health Promotion [ODPHP], 2018). Moreover, at an individual level, "effective treatments may be judged as ineffective" (p. 2) leading to intensified, unwarranted treatment and testing (Lam & Fresco, 2015).

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One proposed solution to reducing ADEs is improved patient medication instruction (Forster et al., 2003; Institute of Medicine [IOM], 2000), and researchers continue both to document the problem and test educational practices that lower risks. One survey of 254 newly discharged, community-dwelling elders identified inaccurate discharge instructions as the top-ranked cause of medication nonadherence (39%; Lindquist et al., 2011), whereas a complementary systematic review of 43 randomized trials demonstrated that 30-day rehospitalizations were reduced by patient-centered discharge instructions and a postdischarge phone call (Hansen et al., 2011).

Unfortunately, quality discharge teaching is not easily achieved. Provider-to-patient instructions are affected by complex individual (e.g., polypharmacy, health literacy, culture, language, provider knowledge deficits), healthcare system (e.g., limited time for provider–patient interaction, fragmented care), organizational (e.g., high workload, policy issues), and technical factors (e.g., look-alike/sound-alike drugs; ODPHP, 2014), as well as financial concerns, inadequate social support, ever-shorter length of stays, noisy learning environments, and lack of continuity in RN caregivers (AHRQ, 2018; Costello, 2015; Cua & Kripalani, 2008; IOM, 2006; ODPHP, 2014). For example, the number of discharge medications alone predicted 30-day rehospitalization rates in one cohort study of 5,507 adult medical patients (Picker et al., 2015), and

Mixon et al. (2014) found that limitations in patients' ability to understand and use numbers and health information (i.e., numerical and health literacy) contributed to many cardiac patients' misremembering (51%) or misunderstanding (59%) their prescriptions (N = 471).

Beyond the above challenges for all patients, persons with cognitive challenges (PWCCs) in comprehension, problem-solving, and memory face additional difficulties in mastering self-medication knowledge and skills. In particular, PWCCs may have issues with prospective memory, which is "remembering to act on previously formed intentions" (p. 160), such as the intention to take medications as prescribed (Fish, Manly, Kopelman, & Morris, 2015).

Unlike other learners, PWCCs also find trial-and-error instruction perplexing because they easily confuse correct information with any self-generated and emotionally charged inaccurate answers. Thus, when PWCCs err and must be corrected, they may become angry, embarrassed, or agitated, and these emotions further interfere with learning (Fish et al., 2015; Powell et al., 2012; Ylvisaker, Hibbard, & Feeney, 2006). Such educational issues may be in part why 87 emergency room RNs (Bay & Strong, 2011) and 10 expert inpatient rehabilitation RNs (Patiag & Highfield, 2017) identified key barriers to PWCC teaching/learning as patient cognition, patient motivation, RN time, and inadequate resources.

Fortunately, current evidence is growing in support of errorless instructional methods as a best practice in helping PWCCs to learn new skills and knowledge (Fish et al., 2015; Hartman, Kegelmeyer, & Kloos, 2018; Oudman et al., 2013; Powell et al., 2012). Errorless teaching/learning (ETL) has been defined as providing learners with generous information, reminders, and cues so "that the learner does not have to—and does not—make mistakes as he or she learns new information or new procedures" (Ylvisaker et al., 2006, para. 1). Such prevention (or precorrection) of mistakes is facilitated by ETL strategies of learner assessment; teacher–learner collaboration; setting clear goals; breaking learning into manageable pieces; and heavy use of cues, images, and repetition. Preventing mistakes prevents learner failure, which prevents accompanying negative emotions (Ylvisaker et al., 2006). According to Fish et al. (2015), images and cues in particular trigger PWCCs' capacity to retrieve and carry out self-management intentions by reducing the need for higher executive function, and authors of a review of 99 studies on cognitive rehabilitation identified errorless methods as an evidence-based "mainstay" (para. 1) in helping persons with total brain injury (Barman, Chatterjee, & Bhide, 2016).

Unfortunately, research is scarce on use of errorless methods in helping PWCCs learn discharge medications. A PubMed search of key words "errorless learning" and "medication" returned seven studies with only one focused on discharge medication instruction (Patiag & Highfield, 2017). In that qualitative study, 10 rehabilitation RNs were educated on ETL benefits, processes, and methods, including medication cards with words and pictures. Informants described ETL and the card as easy to use, supportive of safety, liked by patients and families, and helpful in reinforcing content. Reported barriers to ETL were RN time and too much writing on the cards as designed. No patient outcomes were measured.

Complementing the above study, Hawkins and Firek (2014) tested a pictorial and word medication sheet as a cost-effective, sustainable intervention to improve adherence among 27 cognitively impaired outpatients with heart failure from the Veteran's Administration. The well-received sheets included color photographs of the actual medications dispensed from the VA formulary, and although medication adherence remained low, it improved significantly postintervention. Hawkins and Firek, however, did not focus on errorless methods per se, but only on pictures as a patient preferred way of learning that ameliorates differences between provider and patient literacy in health and language and improves medication recall, comprehension, and adherence (AHRQ, 2015; Katz, Kripalani, & Weiss, 2006; Werner, Thuman, & Maxwell, 2013). More of such nonsimulation research that measures the effect of pictures on patient adherence is needed (Katz et al., 2006).

Given initial evidence that ETL and pictures may be well received and effective with PWCCs, we asked: (1) Does RN use of ETL including pictorial medication cards (ETL + card) improve PWCC adherence to discharge medications? (2) Does using ETL + card increase RN satisfaction and teaching practices and reduce barriers to teaching PWCCs? (3) What additional ways to improve PWCC teaching of discharge medications are identified by rehabilitation staff RNs?

Design and Methods

Using a quasi-experimental design, we collected data before and after the ETL + card intervention from convenience samples of unpaired inpatients with cognitive challenges and paired and unpaired staff RNs. All participants were selected from a 24-bed rehabilitation unit in a 409-bed, suburban, nonprofit, community hospital on the West Coast. Eligible RNs were direct care, rehabilitation RNs excluding float and travel RNs. Eligible patients were those at least 18 years of age, who spoke English, were admitted with a primary or secondary diagnosis of acquired/traumatic brain injury, had an admission Functional Independence Measurement (FIM) score of <5 on

memory, problem-solving, and/or comprehension, and were discharged home. FIM reliability/validity are well established, and a score of <5 meant that a patient needed assistance. Ordinal FIM scores range from 1 (*total assistance*) to 7 (*complete independence*), making scores useful in tracking functional ability (Australian Institute of Health and Welfare, n.d.; Uniform Data System for Medical Rehabilitation, 2014).

Intervention

The intervention consisted of RNs using ETL + card to teach PWCCs about their medications. RNs received instruction on ETL benefits, aims, and methods, including use of investigator-designed, pictorial medication cards as cues. Pictorial cards for the 82 most frequently prescribed drugs on the rehabilitation unit were revised versions of those trialed by Patiag and Highfield (2017) and contained the following information: (a) pharmacy-approved English and Spanish drug information already in use on the facility's existing word-only medication cards; (b) free-to-use, online clipart images; (c) time of day illustrations adapted from Werner et al. (2013); and (d) the 24/7 unit phone number for patient questions. Cards were printed in color, two per page on 8.5 in. × 11 in. white, landscape-oriented, card stock and had a corner, single-hole punch. Pictorial cards replaced word-only cards (see Figure 1 for sample card).

Procedures for using the pictorial card were similar to those for existing word-only cards. The admitting RN pulled

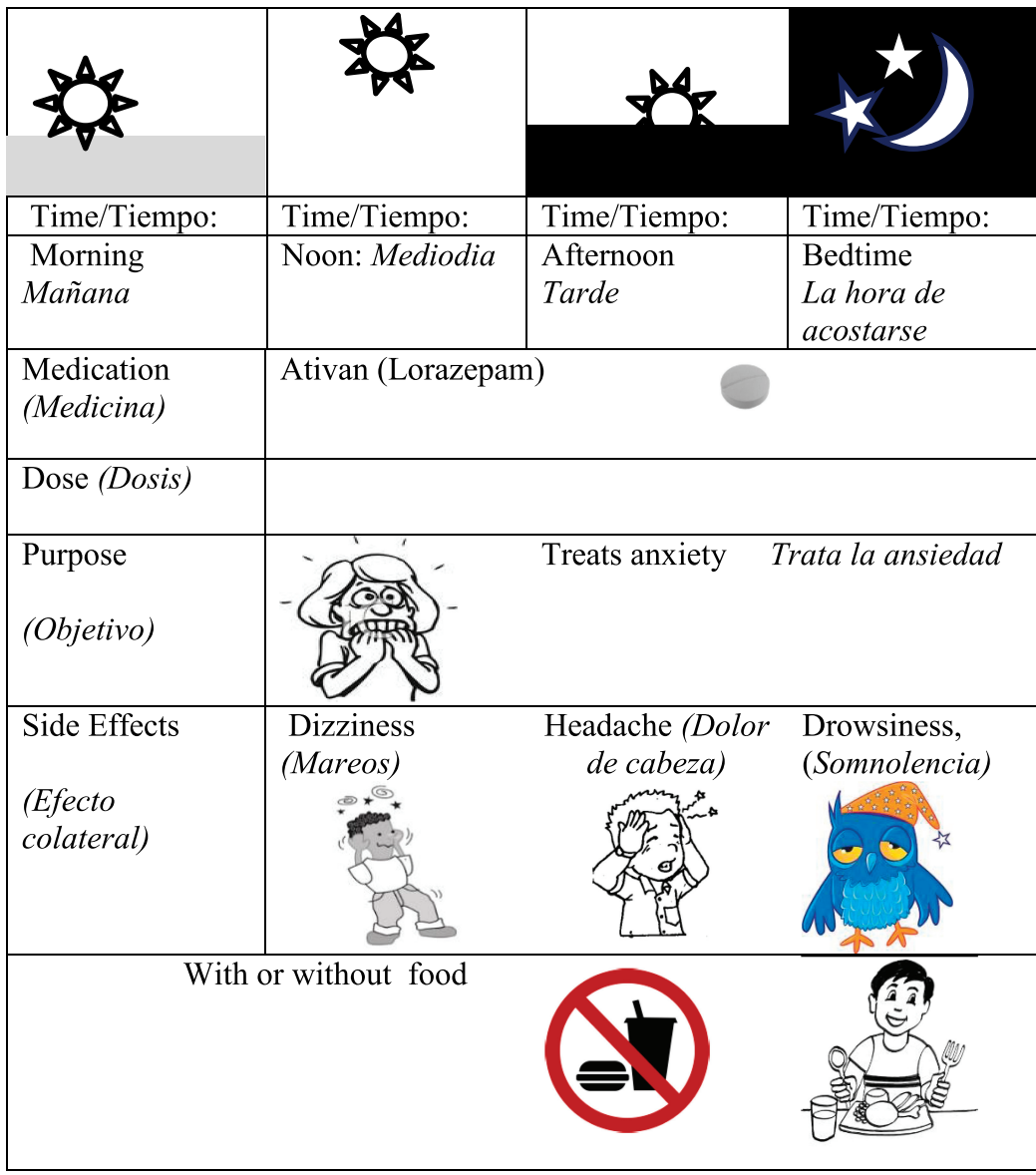

Figure 1. Sample medication pictorial teaching card.

cards for a patient's medications, wrote in the dose, circled dosing times, placed all cards on a ring, and hung the ring of cards on a designated hook at the bedside. During rounds or medication administration, RNs used cards to verbally review at least one medication with each patient. Cards were updated as medication orders changed and at discharge cards on the ring were reconciled with the discharge medication list and sent home with the patient.

Instruments

Patients' postdischarge medication adherence was measured using the Medication Adherence Score Sheet (MAS) adapted from Hawkins and Firek (2014). Their tool included demographics and provider pill counts during clinic visits. Pill counts were then used to calculate a medication adherence score (Hawkins & Firek, 2014).

Our tool adaptation was minimal, including (a) demographic changes (e.g., adding FIM scores and dropping lab values), (b) adding counts of prescriptions written and filled, and (c) pill counts for up to three medicines reported by patients or helpers during a phone call. Like Hawkins and Firek (2014), we excluded over the counter and "as needed" (PRN) medicines, and we also excluded frequently adjusted medications like Coumadin. The adapted MAS yielded two scores: (a) the percentage of total prescriptions filled and (b) a change score as the absolute difference between prescribed and consumed medication doses, whether that difference was in underdosing or overdosing (Hawkins & Firek, 2014). The MAS had face validity, and a single investigator collected MAS data in order to promote reliability.

RN variables were measured using two investigator-designed instruments: Teaching Discharge Meds Questionnaire (TDM) and Observational Tool (OT). Content validity of the TDM and OT were established by investigators as an expert panel. After identifying evidence-based teaching/learning practices and PWCC teaching barriers from the literature, the panel selected final items using an iterative, consensus process. Two panelists were certified in rehabilitation nursing with extensive clinical and management RN rehabilitation experience, and the third was an experienced nurse scientist and educator. Lack of summative TDM and OT internal scales prevented reliability calculations.

The 11-item, self-report TDM asked RNs (a) how often they used each of the seven evidence-based teaching practices that appear in Table 1, (b) whether they were satisfied with the current PWCC discharge medication teaching by answering yes/no, (c) to check PWCC teaching barriers they experienced (Table 2), and (d) to describe other ways to improve PWCC medication instruction. On the nine-item OT, a trained observer recorded whether an RN demonstrated each of the same seven evidence-based teaching practices, as well as whether a family/care partner was at the bedside and minutes spent in each teaching instance. The OT allowed recording a maximum of five patient–nurse interactions during a single observation time, and each nurse was observed only once before and once after the intervention. OT reliability was strengthened by using a single, external, noninvestigator observer with quality monitoring experience. Prior to data collection, both TDM and OT were piloted with a small sample to verify usability and completion time.

Procedure

After institutional review board approval, we obtained written consent and collected baseline data over 4 months. Eligible patients were asked for consent before discharge if their decision-making capacity was confirmed by their physician either verbally to the investigator or in the electronic health record. For patients without such capacity, the investigator asked a legally authorized representative for consent and the patient for assent. A single investigator recruited the sequential sample of patients and completed

Table 1 Observed RN teaching strategies

Observational Strategies List	23 Pre-ETL Interactions *n* (%)	33 Post-ETL Interactions *n* (%)
1. RN listens to patient repeat back medication information.	9 (39)	26 (79)
2. RN uses cues and answers frequently to the patient so that the patient will not make any mistakes in his or her answers (no use of trial-and-error teaching).	9 (39)	22 (67)
3. RN involves family or care partner in teaching patient about medications.	3 (13)[a]	2 (6)[a]
4. RN uses printed materials to teach medications.	2 (9)	7 (21)
5. RN sits down even briefly in the room when teaching.	0 (0)	3 (9)
6. RN asks patient strategies they already use to remember medications.	0 (0)	0 (0)
7. If patient has gastrostomy tube (G-tube) or subcutaneous (SQ) meds, RN watches the patient do return demonstration of self-medication prn.	Not observed	Not observed

[a]These results include encounters when the family was and was not present.

Table 2 RN-reported Teaching Barriers

Teaching Discharge Meds Barriers List	Pre-ETL (n = 5) n (%)	Post-ETL (n = 6) n (%)
• Patient memory[a]	5 (100)	5 (83)
• Discharge medications have a different appearance or dose per pill than inpatient meds[a]	3 (60)	1 (17)
• RN time[b]	3 (60)	6 (100)
• Patient motivation[b]	4 (80)	5 (83)
• At discharge, some medications are added to or dropped from inpatient medications[b]	2 (40)	3 (50)
• My awareness of best practice standards in teaching cognitively challenged patients	3 (60)	1 (17)
• My knowledge of medications	0	0
• I don't have appropriate teaching materials	0	0
• Other [wrote in "language barrier"]	0	1 (17)

Note. Of total barriers each RN checked, RNs also circled their greatest barrier.
[a]Indicates baseline greatest barriers.
[b]Indicates postintervention greatest barriers.

the MAS postdischarge phone calls independent of routine discharge calls. That investigator collected demographic and prescription data from the electronic health record and then during calls gathered patient or care partner reports on whether prescriptions were filled and pill counts. If she identified any safety concern, she asked the person to contact their primary care provider.

At baseline, 28 eligible patients were identified from 77 admissions to the rehabilitation unit, and of these, 18 patients or legal surrogates consented and 10 declined. Eleven consenting participants completed MAS phone calls, one withdrew, two were discharged to skilled nursing facilities (thus becoming ineligible), and four were lost to follow-up (e.g., transferred to another hospital unit before discharge or did not answer phone).

Also at baseline, 11 of 25 rehabilitation staff RNs were recruited via flyers and huddles. In order to maintain confidentiality and to pair pre/post data, RN tools were coded by an investigator who did not work on the unit. Each RN returned a coded TDM in a sealed blank envelope, and the trained observer returned similarly coded OTs. Each RN participant received a $3 coffee card.

After collecting preintervention data, the nurse manager scheduled all rehabilitation RNs for ETL instruction. RNs were expected to begin using ETL + card immediately after the class whether or not they were participants in this study. We also explained the project to physicians, gained their support, invited them to classes, and gave each a handout.

Following 2 months of ETL + card education with coaching and implementation, investigators collected 4 months of postintervention data, using the same procedures as at baseline. A nonequivalent group of 49 eligible patients were identified from 103 admitted to the rehabilitation unit. Of these 49, 16 declined participation, 15 patients or legal surrogates consented, and 11 completed MAS tools during postdischarge calls. The remaining consenting and nonconsenting patients were lost to follow-up. Consenting RNs again completed the TDM and OT.

Results

Data were entered into an Excel spread sheet for cleaning and analysis using SPSS Version 22 (IBM Corp., 2013). Unpaired patient groups had a 39% response rate at baseline (n = 11), and 23% response rate postintervention (n = 11). Baseline patients included six males and five females, and postintervention patients included seven males and four females. Stroke was the most common diagnosis, and seven pre-ETL and nine post-ETL patients had a care partner help with medicines 7 days a week. Using unpaired t tests, pre/post patient groups were similar ($p > .05$) in the following:

- Years of age (pre M = 68, SD = 17.5/post M = 65, SD = 13), $t(20) = 0.47$, $p = .64$;
- Number of days postdischarge when the phone call was completed (pre M = 10.5, SD = 6/post M = 10, SD = 3), $t(19) = 0.24$, $p = .81$;
- Admission FIM scores for memory (pre M = 3.3, SD = 0.7/post M = 2.8, SD = 1), $t(20) = 1.2$, $p = .25$; comprehension (pre M = 4.3, SD = 0.9/post M = 3.8, SD = 1.5), $t(20) = 0.87$, $p = .39$; and problem-solving (pre M = 3.6, SD = 0.9/post M = 3.5, SD = 1), $t(20) = 0.37$, $p = .72$; and
- Discharge FIM scores for memory (pre M = 4.8, SD = 1/post M = 4.6, SD = 2), $t(20) = 0.26$, $p = .79$; comprehension (pre M = 5.5, SD = 0.8/post M = 5.4, SD = 2), $t(20) = 0.17$, $p = .87$; and problem-solving (pre M = 5.1, SD = 0.9/post M = 4.3, SD = 1.5), $t(20) = 1.5$, $p = .15$.

RN baseline response rate was 36% with only five completing TDMs and OTs and four more completing OT (n = 9), and postintervention response rate was 32% with six RNs completing both TDMs and OTs and two

additional RNs completed OT (n = 8). Among these only 5 of 25 eligible RNs (20%) provided paired baseline and postintervention TDM and OT data. Paired RNs reported an average of 17.4 years in nursing practice with 12.2 of those years in rehabilitation. One was CRRN certified, and three had a BSN as their highest nursing degree. Most spoke English as their primary language, and their mean age was 39 years. Two declined to self-identify ethnicity, whereas two others identified as Asian and one as White.

Medication Adherence

Whether or not ETL + card increased postdischarge medication adherence was determined by descriptive analysis and unpaired t tests of patients' pre/post MAS data. First, providers wrote more baseline discharge prescriptions (pre M = 13, SD = 4/post M = 5.6, SD = 4.1), $t(18)$ = 4.0, p = .001, and patients filled more at baseline (pre M = 8.7, SD = 3.1/post M = 5.3, SD = 2.9), $t(16)$ = 2.6, p = .02. However, postintervention patients filled 85% of their prescriptions, whereas baseline patients filled only 67% of theirs. Second, MAS adherence scores—the absolute difference between doses prescribed and taken—did not improve from baseline (M = 86.5, SD = 15) to postintervention (M = 95, SD = 9), $t(20)$ = 1.1, p = .92, even without an outlier post-ETL patient who filled only one of eight prescriptions (n = 10, p = .15).

RN Practices and Barriers

In order to identify whether ETL + card increased RN teaching and satisfaction or reduced barriers, we analyzed pre/post TDM self-reports and pre/post OT observations. First, self-reported satisfaction with "the current way that we teach discharge medications to cognitively challenged patients" rose on a yes/no dichotomous scale from 0% at baseline to 50% after ETL implementation (n = 6). Second, when RNs were asked to self-rate how often they used each of the seven teaching practices on a 4-point Likert scale of 0 (*never*), 1 (*sometimes*), 2 (*often*), or 3 (*always*), TDM paired t-testing revealed no increase in any practice (n = 5, p > .05).

- Pre/post means were identical for the most commonly reported strategy of engaging care partners (M = 2.8, SD = 0.4).
- Pre/post means were also identical (pre M = 2.4/post M = 2.6) but differed in standard deviations for the next three most frequently used strategies: (a) teach-back (pre SD = 0.9/post SD = 0.6), $t(4)$ = 0.41, p = .70; (b) return demonstration of subcutaneous (SQ) or gastrostomy tube (GT-tube) medications (pre SD = 1.3/post SD = 0.6), $t(4)$ = 0.27, p = .79; and (c) use of printed material (pre SD = 0.9/post SD = 0.6), $t(4)$ = 0.54, p = .62.
- Pre/post mean differences were nonsignificant for the three least used strategies: (a) cuing and preventing patient mistakes (pre M = 2.0, SD = 0.7/post M = 2.2, SD = 0.8), $t(4)$ = 0.34, p = .75; (b) sitting during instruction (pre M = 1.6, SD = 0.6/post M = 2.0, SD = 1.0), $t(4)$ = 0.78, p = .48; and (c) assessing existing patient learning strategies (pre M = 1.2, SD = 1.3/post M = 1.6, SD = 0.9), $t(4)$ = 1.6, p = .18.

In contrast to self-reports, the most frequently observed RN practices were teach-back and precorrecting errors (Table 1). When care partners were present during teaching interactions, observed RNs engaged them in three of four (75%) baseline instances and in only 2 of 10 (20%) postintervention instances. In 3 of 33 (9%) postintervention observations, no pictorial cards were in the room, and no RN assessed patients' prior learning strategies. The observer recorded anecdotally that one family member took a phone call during medication administration when teaching would occur, one patient did not "want to be tested" on medications, and another declined instruction. The television remained on during many interactions, although three baseline patients took initiative in turning it down or off.

At baseline, no medication teaching was observed in 8 of 23 (35%) teaching encounters by nine RNs, whereas eight postintervention RNs used at least one teaching strategy in 100% of their 33 teaching encounters (Table 1). Although the number of observed teaching strategies per encounter increased significantly from baseline (M = 1.1, SD = 0.9) to postintervention (M = 1.9, SD = 1.0), $t(53)$ = 3.1, p = .003, RN minutes per teaching encounter were unchanged (pre M = 8.5, SD = 5.8/post M = 9.6, SD = 4.5), $t(54)$ = 0.84, p = .41.

Next, whether ETL reduced teaching barriers was limited by a small sample size to descriptive analysis of RN responses to the TDM barriers checklist (n = 6; Table 2). Patient memory and motivation were among the most common challenges both before and after ETL, and all post-ETL respondents noted RN time as an issue. Awareness of best PWCC teaching practices that was originally a barrier for three of five RNs (60%) dropped to being a barrier for only one of six postintervention RNs (17%). Identification of the greatest barrier differed in pre/post responses.

Suggested Improvements

Finally, additional ways to improve PWCC instruction were identified by descriptive content analysis of combined pre/post TDM narrative suggestions (n = 6). All comments were included, and themes focused on grouping

explicit comments without deriving larger meaning (Tesch, 1987). RNs recommended involving care partners, scheduling teaching (i.e., early, uninterrupted teaching time, teaching appointments), and using teaching/learning aids (i.e., printed cards, medication pictures, and unspecified organizing "color chart"). Two post-ETL RNs commended the new pictorial medication cards, but none mentioned other ETL strategies.

Limitations

Limitations of the project included (a) reliance on patient and care partners' phone reports of medication adherence rather than direct provider observation because of budget constraints; (b) available measurement instruments with limited reliability/validity; (c) a small, nonprobability, underpowered RN sample that limited paired inferential analysis and may have prevented detection of some small but significant changes; (d) potential Hawthorne effect that changed RN behavior during observations; (e) observational time sampling with potential for observer underreporting of select teaching practices (e.g., return demonstration of G-tube medications); and (f) possible social desirability bias that could generate RN overreporting of teaching practices.

Unknown is why few RNs participated despite vigorous recruitment efforts and confidentiality protections. Anecdotally, several RNs reported not wanting to be observed, despite reminders that unrelated quality observations would occur later. In contrast, several RNs, who did not complete self-reports, did permit observations. Our smaller-than-planned sample limited inferential testing, but even a very large nonprobability sample would still not produce generalizable findings.

Discussion

Despite its limitations, the study remains valuable as an information-rich, if nongeneralizable, project that raises practice and research considerations. Patients' adherence scores and filling of prescriptions merit consideration together as well as separately, as do RNs' teaching satisfaction, practices, and time.

First, although our pre/post patients reported the same accuracy in self-administration of medications, patients receiving ETL + card filled more of their written prescriptions. When self-dosing and filled prescription data are taken together, they suggest higher overall postintervention medication adherence: Postintervention patients consumed a more complete array of their written prescriptions.

Second, numerically higher adherence scores after ETL + card suggest a clinically (albeit not statistically) significant reduction in potential ADE dangers for some in our study (ODPHP, 2014). In an interesting comparison perhaps related to population differences, our patients' preintervention adherence score mean exceeded acceptable adherence rates and was numerically higher than that of Hawkins and Firek's (2014) postintervention VA patients.

Third, why pre/post patient participants filled some but not other prescriptions is unknown, especially because daily care partners were available to assist a majority in both groups. Perhaps some took the same prescriptions preadmission and simply continued using medicine on hand, whereas others may not have filled prescriptions because of other common barriers (AHRQ, 2018; Costello, 2015; Cua & Kripalani, 2008; IOM, 2006; ODPHP, 2014; Lindquist et al., 2011; Mixon et al., 2014). Theoretically, these PWCCs' prospective memory limitations may have prevented their acting in a full, timely, and correct manner on their intentions (Fish et al., 2015).

Fourth, a lack of improvement in respondents' self-dosing (adherence scores) may have been because of (a) RNs' use of effective instructional strategies before ETL + card as suggested by self-reports and observations, (b) study limitations, and (c) some RNs' incomplete implementation of ETL + card as suggested by their limited learner assessment, missing pictorial cards in almost 10% of postintervention observations, and televisions that remained on during teaching.

Finally, observed postintervention RNs used more teaching practices more often in more teaching episodes and were more satisfied with their teaching. Their increased satisfaction may have been related to increased awareness of effective PWCC teaching practices, having the pictorial card as a new resource, and self-selected respondents' willingness to change. At the same time, RN total teaching time increased, and "RN time" became respondents' top postintervention instructional barrier, probably because of the combined higher frequency of teaching and nonsignificant rise of about 1 minute per educational interaction.

Implications

Clinical implications of our empirical and anecdotal findings include exploring ways to (a) reduce educational barriers, (b) enhance PWCC instruction, and (c) improve systems. Quality improvement monitoring of related processes and outcomes are warranted. The barrier of RN time may be reduced by respondent-suggested scheduled teaching times, and barriers of patient memory and motivation may be overcome by longer implementation of a full array of ETL strategies such as those listed by Ylvisaker et al. (2006) alongside other best practices as

Key Practice Points

- Persons with impaired memory, cognition, and problem-solving learn differently.
- Errorless teaching/learning (ETL) methods that use heavy cuing may improve discharge medication instruction for these persons with cognitive challenges (PWCCs).
- After using ETL including pictorial medication cards to teach PWCCs, RN teaching strategies and satisfaction increased and patients filled a higher percentage of their prescriptions.
- Patient memory, patient motivation, and RN time were still teaching barriers.

in Table 1. Facilities should establish a system for creating, reproducing, and distributing cards, and per our respondent recommendations, cards should have the medication name at the top.

Systems may also be improved by supplying all discharge medicines to patients before they leave the hospital and then verifying dosing adherence with the aims of reducing PWCC prospective memory issues related to self-management (Fish et al., 2015), decreasing 30-day readmissions (Hansen et al., 2011), improving safety (IOM, 2014), and avoiding differing inpatient-to-outpatient medication appearance or dose per pill (ODPHP, 2014). Quality improvement monitoring remains critical because, even with facility-filled prescriptions and pictorial medication sheets, patient adherence may continue below that needed for "event-free survival" (Hawkins & Firek, 2014, p. 1).

Finally, our findings are preliminary, and further rigorous prospective studies exploring effects of ETL on PWCCs' medication self-management are needed. Randomized trials with representative samples from different settings along with thorough implementation of ETL + card within the experimental group would strengthen confidence in findings, as would further validity and reliability testing of instruments. Katz et al.'s (2006) call for more nonsimulation research on using pictures to improve adherence remains relevant. A systematic review of all research on use of errorless methods in healthcare settings might also better inform nursing discharge medication instruction.

Conclusion

After ETL + card was implemented, RN respondents' teaching and satisfaction rose without increasing their time per educational interaction, and patients filled a wider array of their prescriptions. While our findings complement existing evidence, more research is needed to determine the impact of ETL + card on PWCCs' medication adherence and ultimately on reducing ADE dangers during hospital to home transitions.

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