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Using a Medication Plan as a Quality Indicator: Feasibility and Satisfaction Results from an Observational Study

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Abstract

Background: Medication adherence remains a challenge for patient management. Changes in the drug regimen after a hospital stay can lead to confusion or misunderstandings. We implemented a structured patient-centered interview during which a computer-generated individualized medication plan was discussed and provided to patients at discharge.

Objective: To explore whether a medication plan can be a quality indicator, in terms of its content (*quality)* and its implementation in the resident's workflow (*feasibility)*.

Methods: An observational mixed method study with interviews of 174 patients from general internal medicine wards at 1 week and 1 month after discharge, and of 91 physicians at baseline. We report the quality of the medication plan in terms of content and state of completion. We describe feasibility for residents to complete this plan, as well as patient and resident satisfaction with the plan.

Results: 83% of participants received a medication plan. Physicians verified renal function (83%) to adapt doses but did not regularly assess for medication interactions (43%). Incomplete plans (61%), were due to blanks when physicians considered the information irrelevant for their patients. Error rate was <3%. Patients reported low use of their plan after discharge (64% found it useful after 1 week, whereas only 37% used it when taking their medication 1 week after discharge).

Conclusion: Although the plans were considered useful by both patients and physicians, their implementation could have been optimized by considering the overall process (creation to patient use). Mobile apps could help fill gaps in supporting patients for medication adherence.

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Introduction

Low medication adherence is a well-identified challenge for quality of healthcare, in particular for chronic disease management and during care transitions such as discharge after a hospital stay. According to the WHO, adherence is defined as "the extent to which the person's behaviour (including medication-taking) corresponds with agreed recommendations from a healthcare provider."[1] Many discharged patients lack knowledge about important aspects of their medications, especially for modified drug regimens.[2, 3] This lack of knowledge, in particular concerning the benefits off taking the drugs as prescribed, may reduce adherence and may lead to ADEs.[4] The medical literature on medication adherence has shown the benefits of providing a medication plan with a list of drugs and their dosing schedule. In a prior study, we assessed the impact of a structured patient-centered encounter performed by residents before discharge.[2] During the encounter, a medication plan print-out, containing individualized information in a standardized format, was discussed with and given to the patient. This patient-centered encounter with the medication plan significantly increased patients' knowledge about their medication, which was assessed with a standardized phone-based questionnaire to all patients one week after discharge, and in their intent on taking the prescribed medication. Although the quality of the medication plans (i.e., their content and state of completion) can potentially improve patients' adherence, the feasibility of a systematically used medication plan can also impact the residents' workload, especially if there are several fields to complete for each medication. Furthermore, partially completed plans can affect the quality of the medication plan, and potentially decrease patient adherence to their medication.

An unpublished survey of 54 physicians (6 clerks and 48 interns) in our division in 2009 showed that most physicians (83.9 ± 23.7%) conducted an interview with patients prior to discharge and generally reported using the medication plan (80.3 ± 31.4%). Most physicians (70%) were satisfied with the content of the plan, and found that it was useful for patients, particularly when the drug regimen was complex.

This study explores the acceptability of a medication plan as a quality measure, both in terms of the quality of the medication plan and its feasibility for the residents in the wards. After exploring the actual use of these medication plans, and their quality and state of completion, we then report patients' and residents' satisfaction and their perceived use and usefulness. Finally, we will discuss the barriers to creating these plans for the residents and describe approaches for improvement.

Methods

The study is an observational prospective trial conducted in the General Internal Medicine Division of a University Hospital of physicians and patients. We enrolled 177 adult patients from 10 medicine wards during July 2009 to September 2010, who were discharged to their home with at least one prescribed drug. Patients were recruited by convenience sampling. Our exclusion criteria were: severe cognitive deficits (MMSE <18), inability to communicate in French, transfers from other institutions, no available phone number after discharge and hearing impairment (inability to repeat numbers whispered 50cm away).

Patients were interviewed in person prior to discharge, and were interview by phone one week and one month after discharge. If participants were unable to meet with an investigator prior to discharge, they were called the next day. We collected demographic characteristics of the patients (age, gender, nationality, profession), reason of admission, discharge diagnoses (used for Charlson score), length of stay, creatinemia and weight, medication at admission and at discharge, and readmissions at 1 week and at 1 month. These data were extracted from the electronic medical record. We also documented whether they received a medication plan or not. During the follow-up calls, we enquired about the patient's satisfaction with the medication plan.

Our first outcome was the quality of the medication plans: for this study, we defined quality according to indication, medication dose, schedule and side effects in the plans. A more detailed analysis of the plans will be reported in another paper. Our second outcome was the patient's adherence to the medication plan at one week and at one month, collected by phone interview. We also assessed the content of the medication plans to identify inappropriate (off-label)

prescriptions and adjustments for renal function. The electronic health record provides an estimation of renal function according to MDRD, and screens for drug interactions. Physicians had an institutional access to Lexicomp® Drug Interactions [5] for further enquiry.

Physicians who managed the recruited patients during their rotation in the wards were recruited by convenience sampling on a voluntary basis for this study. We collected basic demographic data on gender, year of graduation from medical school, and years of experience in internal medicine. We also conducted interviews with the residents using the example of a medication plan for one of their patients, to elicit usual practices and potential barriers with the medication plan. We also enquired about general satisfaction with the plan, and discussed approaches for improvement.

The local ethical committee approved the study, and patients provided their signed consent.

Analyses

We will use descriptive statistics to report participant characteristics according to the medication plan group and control group. We will report results on the quality of the medication plan (percent of completed fields, adequate prescriptions, adaptations for renal function, and medication interactions). We will also use descriptive statistics to present the general survey results of the residents. We will then use a regression model to compare treatment adherence among those with and without a medication plan, with a Chi2 analysis for categorical variables and t-test for continuous variables), adjusting for potential confounders. Finally, we will then use qualitative analysis (thematic analysis) and quantitative analyses of the correlated resident and patient interview results to explore predictors for better medication adherence.

Results

Patient and Physician Characteristics for the Individual Interviews

Among the 177 recruited patients, 174 had a discharge encounter with a physician. Of these, 83% of patients (n=142) received a medication plan. Table 1 summarizes the patient characteristics by medication plan group. Apart from the number of medications, which was higher in the medication plan group, there was no significant difference between the groups.

Ninety-one residents or clerks participated in the study (76 residents or 83.5%, and 14 clerks) with 59.3% females. The physicians who participated in the individual interviews had an average of 3.8±3.3y experience, with an average of 1.2±0.7y in the internal medicine residency program. Eighty-three of the physicians had completed at least one medication plan, and about half (n=44) had completed two or more medication plans.

Quality of the Medication Plans

The plan allowed users to fill in six data fields for each medication: the name, the dosage, the galenic form, the indication, the dosing schedule and side effects. Overall, 142 discharge plans were reviewed and the data were complete in 54 plans (38%). Among the 88 incomplete discharge plans, the side effects and dosing schedules were respectively missing in 74 (84%) and 28 (32%) cases. Reasons for not fully completing the plans were explored during the interviews with the prescribers after the patient's discharge. A thematic analysis of these reasons is presented in the table 2.

The 142 medication plans were analysed for errors and missing data in the daily schedule. Out of the 142 daily schedules, we recorded 4 errors, of which 2 were in the same plan. We also noted 1 error in the adverse event column in the medication plans. Out of the total 949 drugs in the plans, 24 drug indications in 9 plans were erroneous (2.5%), 15 (1.6%) indications were incomplete and 176 (18.5%) were missing, whereas 734 (77.3%) indications were correct. Three plans had both erroneous and incomplete drug indications.

Discharge Encounter

On average, the encounter between the patient and physician lasted 11 ± 7.15 minutes. In these encounters, the medication plan at discharge was always discussed, whereas other future plans (returning to work, next medical appointment, etc.) were also discussed in 89% of the encounters. In 69% of the encounters, physicians summarized the hospitalization, whereas other topics such as health promotion, and medication side effects were only reported in 12% of the encounters.

Table 1. Patient characteristics

	Medication plan mean (SD or %)	No medication plan mean (SD or %)	p-value
N	142 (80.2)	35 (19.8)	
Female (n)	67 (47.2)	16 (45.7)	0.88
Age (Y)	61.8 (17)	58.8 (16.3)	0.34
Nationality(n)			
Swiss	94 (66.2)	21 (14.8)	0.71
Other	48 (33.8)	14 (9.9)	
Language (n, SD)			
French	83 (58.5)	20 (57.1)	0.93
Other	59 (41.6)	15 (42.9)	
Civil status			
Single	22 (15.5)	3 (8.6)	0.22
Married	76 (53.5)	20 (57.1)	
Divorced	26 (18.3)	8 (22.9)	
Widowed	18 (12.7)	1 (8.6)	
Education			
Primary school	16 (11.3)	3 (8.6)	0.53
High school	38 (26.8)	11 (31.4)	
Bachelor equivalent	56 (39.4)	10 (28.6)	
University	32 (22.5)	11 (31.4)	
Hospitalisazation details			
Lenth of stay (days)	8.79 (0.5)	7.23 (0.6)	0.11
Number of medications	6.7 (0.3)	2.3 (0.6)	<.001
Data source for medication history			
Admission note	139 (97.9)	34 (97.1)	0.74
ED report	119 (83.8)	30 (85.7)	0.87
PCP letter	69 (48.6)	18 (51.4)	0.76
Clinical condition			
MMSE	28.7 (0.1)	29.1 (0.2)	0.19
Creatininemia (µmol/l)	97 (6)	73.6 (4.5)	0.06
Weight (kg)	75.5 (1.6)	72.8 (2.7)	0.44
Cockroft (ml/min)	89.3 (3.9)	101.9 (7.8)	0.15
MDRD (ml/min)	40.1 (2.4)	45.5 (11.5)	0.61
Medication allergies (n)	43 (30.3)	11 (31.4)	0.88

Charlson comorbidity index (%)			
None (O)	47 (33.1)	8 (22.9)	0.001
Low (1-2)	53 (37.3)	5 (14.3)	
Moderate (3-4)	23 (16.2)	8 (22.9)	
High (>5)	19 (13.4)	14 (40.0)	
Main diagnosis			
Cardiovascular	30 (21.1)	1 (2.9)	<0.001
Pulmonary	35 (24.7)	7 (20)	
Endocrine or metabolic	6 (4.2)	2 (5.7)	
Infectious	36 (25.4)	1 (2.9)	
Cancer or hematology	5 (3.5)	2 (5.7)	
Neurology	7 (4.9)	0 (0)	
Digestive or hepatic	12 (8.5)	0 (0)	
Osteo-articular	5 (3.5)	0 (0)	
Renal	5 (3.5)	0 (0)	
Other	1 (0.7)	22 (62.9)	

Table 2. Thematic analysis of incomplete medication plans, from the physician interviews

Typology of cause	Side effects (n=74)	Dosing schedules (n=28)	Drug indication (n=16)
Perceived as unnecessary	Patient familiar with adverse effect (long-term treatment) (n=14) Low pertinence for patient (n=13) Risk outweighs the benefits (n=6) No pertinent serious adverse effect (n=1)	Schedule not needed or absent (n=2)	Patient familiar with indication (n=8) Low pertinence for patient (n=1)
Organisational constraints	Time constraints (n=7)	Time constraints (n=1)	
Discharge summary format is not adapted	Due to technical limitations (n=4) Due to the size of the plan (n=2)		Due to technical limitations (n=1)
	No specific answer (n=27)	No specific answer (n=7)	No specific answer (n=6)

Medication Plan and Discharge Encounter Process and Quality

In the large majority of cases (92%), physicians generated the medication plans before conducting the discharge encounter. For eight patients (6%), the plan was filled in after the encounter, and in three cases (2%), the plan was completed during the encounter.

The quality of the medication plan depends on the consideration of factors that can potentially contribute to adverse events. These factors are: medication interactions, which can engender supra- or infra-therapeutic effects, renal function and comorbidities, which may require adjustments of drug dosages. In our dataset, the physicians reported verifying the patient's renal function in the majority of cases (82%), but did not consider medication interactions in 43.9% of the cases. In over half of the cases, physicians did not consider it necessary to adjust dosages for the comorbidities. Statistically, there was no significant difference in the assessment of the three factors among patients with and without medication plan. The results from the physician survey are presented in Table 3.

In our analysis of the medication plans, 50 drugs required renal adaptation: of these, 23 (46%) were prescribed correctly, and 27 (54%) drugs were not adapted. There were no "X" (or "avoid combination" by Lexicomp® recommendations[5]) drug interactions in the dataset; 93 "D" interactions suggested considering therapy modification. Of these "D" interactions, nine were considered justified in the given clinical context.

The physicians also explained why some patients did not receive a medication plan. These reasons can be classified into four main categories: perceived as unnecessary (by the physician), organisational constraints, omission and patient refusal. The details are presented in Table 4.

The discharge encounter provides an opportunity for the patient to ask the doctor questions. Among the 30 patients who did not receive a plan, half of these asked questions during the encounter. Among the 142 patients who received a plan, 90 patients (63%) made enquiries during the encounter.

The Medication Plan and Patient Needs

The discussion during the encounter allowed physicians to adapt the information in the medication plans. Twenty-seven (19%) of the plans were modified after this discussion. Nearly half of the modifications in the plans were adaptations to the patient's daily habits or corrections. In 7 of the plans, adjustments were additional PRN medications or removal of inappropriate medications. In 6 of the 27 plans, the physicians added an end date for a medication. Other modifications were indication of treatment (4 plans), side effect (3) or dosage (2).

Usefulness of the Medication plan for the Patient After Discharge

Among individuals who received a medication plan, 64.1% reported finding it useful at one week, whereas only 28% found it useful at one month. At the one-week interview, however, 91 patients (63%) reported that they did not use the medication plan when taking their medication at home. Forty-seven patients (33%) reported always using the plan, and 6 patients (4%) sometimes used the plan.

Medication Plan and Adherence

The regression analyses comparing medication adherence among those with and those without a medication plan did not show any significant difference ($p=.19$ at 1 week and $p=.65$ at 1 month in the unadjusted model), even after adjusting for patient age, comorbidity, renal function and physician level of experience.

Discussion

In our observational study, we found that the majority (83%) of patients received a medication plan at discharge, as per the division's recommendation for good practice. There were very few errors in the study, despite low consideration of medication interactions. Close to 60% of the plans were incomplete, however, mainly because physicians considered these fields to be of low pertinence for their patients. Physician perceptions of and actual patient needs may differ: in one study of hospitalized patients, 77% physicians thought their patients knew their diagnosis, whereas only 57% of patients actually did.[6] Likewise, despite 80% of physicians claiming to explain adverse effects

Table 3. Plan preparation (results from physician interviews).

	Physician responses	Patients without a plan % (n)	Patients with a plan % (n)	P-value
Checked for medication interactions	Yes	38% (11)	40% (58)	0.43
	No	38% (11)	45% (65)	
	Not needed	24% (7)	15% (21)	
Checked renal function	Yes	83% (25)	81% (117)	0.43
	No	10% (3)	6%(8)	
	Not needed	7% (2)	13% (19)	
Checked dosage according to comorbidities	Yes	40% (12)	40% (57)	0.70
	No	7% (2)	3% (5)	
	Not needed	53% (16)	57% (82)	

Table 4. Reasons for not giving patients a plan (results from physician interviews)

Reasons for not giving the patient a plan	N (%)	Examples
Perceived as unnecessary	21 (60%)	two "usual" medications [that patient already takes] same treatment as at admission
Omission	2 (6%)	Plan was left on the desk Not used to using the plan
Organisational constraints	2 (6%)	Patient left the hospital before the plan was completed
Patient refusal	2 (6%)	Patient did not want a medication plan
No answer	8 (23%)	

for new medications, 90% of patients reported never being told about adverse effect.[6] These discrepancies suggest that these medication plans should be more complete.

Our study emphasizes the importance of carefully considering the whole workflow process when introducing new tools, if the tools are to be properly implemented. Although the medication plan used in our division was created according to evidence-based principles, its lack of integration in the resident's work process and the time required to complete the plan hinder its actual use. Future considerations for implementation should review the entire medication reconciliation and discharge process, and should include other health professionals. For example, a clinical pharmacist could begin the reconciliation process and complete the plan, which is then reviewed by the physician, to individualize its content for the patient. The physician review is useful, because the selection of relevant facts (estimated at less than 50%)[7] can be even further restricted, by identifying the facts that are pertinent for a given patient, or based on prior knowledge of the medications, for example.

Revising in the process should also include improvements in the functionalities and ergonomy when creating the plan, to reduce the time needed for its completion. For example, by improving the database for side effects, the physician should only make a selection from a list of possible side effects for a given medication. The content could be further improved in terms of health literacy for the patient, describing effect in terms of effects that the patient could sense rather than a pathophysiological process (ex: weakness rather than hypokalemia). Although many patient information sheets exist in the drug databases, these are often too complex or too detailed for the patient to understand.[8, 9]

Our findings suggest moderate perception of usefulness and low actual use of the plan. In the unpublished survey conducted prior to this study, physicians reported that they considered the plan useful mainly for patients with complex drug regimens, and found it useful as a visual support tool during the discharge encounter. In fact, the discharge encounter enabled 19% of the plans to be modified. The patients reported a low use of the plan, with less than 2/3 of the patients finding it useful one week after discharge, and only 1/3 of patients actually using it when taking their medications. There are several potential reasons for this low use of the plan, such as changes made by the primary care provider after discharge, new names of medications (ie.g. a different generic given by the pharmacy) than the one in the plan, or medications administered by a home nurse.

Although receiving a plan was not associated with medication adherence after discharge in our study (potentially due to lack of power), we propose several possible strategies for future work. First, patients should be able to easily modify their medication plan, so that their plan is always up to date. Second, the plan should be readily available whenever and wherever the context. Third, low adherence has been reported to be largely due to forgetfulness in prior literature,[10] so plans should also be accompanied with timely reminders. All three considerations can easily be addressed with a mobile application for a smartphone or tablet,[11] since the high adoption of mobile devices also reaches older adults. In fact, a recent meta-analysis reported a 17% increase in medication adherence with text messaging.[12]

Several limitations can be identified for our study. First, it was designed to study the implementation of a medication plan, after giving recommendations for its use in our division. Its observational nature however led to unbalanced groups, with statistical limitations. Second, it is based on self-report, which depends on the participant's perceptions. Third, it lacked statistical power to study medication adherence after discharge, which limits the generalizability of our results. Finally, the study was carried out over a long period of time, which could have affected the residents' practices and/or the application of the recommendation to use the plan.

Conclusion

We conclude that medications plans can potentially be used as quality indicators, as long as both its use and the quality of its content in consideration. Furthermore, we see that implementation of a tool, even if grounded with evidence of benefits, needs to address the whole process from the physician to the patient. In our case, we need to improve the creation of the plan

from the informatics perspective, as well as consider the patients' needs in terms of flexibility and availability. Future works could focus on the use of well-designed mobile applications for medication management, which can address the shortcomings of paper-based tools.

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References

1. Sabaté E. Adherence to long-term therapies: evidence for action. 2003.
2. Louis-Simonet M, Kossovsky MP, Sarasin FP, Chopard P, Gabriel V, Perneger TV, et al. Effects of a structured patient-centered discharge interview on patients' knowledge about their medications. Am J Med. 2004;117:563-8.
3. Mansur N, Weiss A, Hoffman A, Gruenewald T, Beloosesky Y. Continuity and adherence to long-term drug treatment by geriatric patients after hospital discharge: a prospective cohort study. Drugs Aging. 2008;25:861-70.
4. Haynes RB, Ackloo E, Sahota N, McDonald HP, Yao X. Interventions for enhancing medication adherence. Cochrane Database Syst Rev. 2008:CD000011.
5. Lexicomp®. Lexicomp® OnlineTM. Clinical drug information: Interactions. In: guide Lou, editor.: Wolters Kluwer; 2018.
6. Olson DP, Windish DM. Communication discrepancies between physicians and hospitalized patients. Arch Intern Med. 2010;170:1302-7.
7. Guignard B, Bonnabry P, Perrier A, Dayer P, Desmeules J, Samer CF. Drug-related problems identification in general internal medicine: The impact and role of the clinical pharmacist and pharmacologist. Eur J Intern Med. 2015;26:399-406.
8. Ngoh LN. Health literacy: A barrier to pharmacist–patient communication and medication adherence. Journal of the American Pharmacists Association. 2009;49:e132-e49.
9. Lee Ym Fau - Yu HY, Yu Hy Fau - You M-A, You Ma Fau - Son Y-J, Son YJ. Impact of health literacy on medication adherence in older people with chronic diseases.
10. Aggarwal B, Pender A, Mosca L, Mochari-Greenberger H. Factors associated with medication adherence among heart failure patients and their caregivers. J Nurs Educ Pract. 2015;5: 22-7.
11. Bosworth HB, Granger BB, Mendys P, Brindis R, Burkholder R, Czajkowski SM, et al. Medication Adherence: A Call for Action. American heart journal. 2011;162:412-24.
12. Thakkar J, Redfern J, Chow CK. Text Messaging and Medication Adherence-Do We Have a Missed Call?-Reply. JAMA Intern Med. 2016;176:1227.