External Support for Collaborative Medication Planning by Patients and Providers

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Older adults' medication nonadherence is an important patient safety issue. Adherence depends on plans that instantiate treatment guidelines in the context of patients' daily lives, but the ability to create successful plans is often undercut by poor collaboration between providers and patients. We investigated whether external aids can support the provider/patient collaboration needed to create effective plans for taking multiple medications. We tested whether an external aid that was designed to reduce cognitive load associated with collaborative problem solving ("medtable") was more effective than an unstructured aid (blank paper) in a simulated patient/provider collaboration task. Findings suggested that pairs of older adults worked together more efficiently to create accurate schedules when using the medtable.

INTRODUCTION

Patient safety issues related to elders' medication use and other self-care activities are a growing concern because our aging society must cope with a health care system that places increasing responsibility on patients for managing their own illness. Medication use depends on plans that instantiate treatment guidelines in the context of patients' daily lives (Park & Jones, 1997). Developing these adherence plans in turn depends on collaboration between patients and providers such as physicians or nurses, because adherence must be grounded in concordance, or agreement, between patient and provider (Morrow, 1997; Vermeire et al., 2001). Unfortunately, "collaborative lapses" between patients and providers can undermine planning, contributing to poor patient self-care. Providers may not give enough information to patients (Sleath et al., 1997), may provide poorly organized information (Ley, 1997), or fail to check that patients understand the information that is presented (Schillinger et al., 2003). As a result, patients can leave consultations without a clear plan about what to do, and end up either calling back to clarify confusion (Morrow, Raquel, & Sugrue, 2005) or developing incorrect plans on their own, leading to medication errors (Aspden et al., 2007). Older patients with limited cognitive and/or literacy abilities are especially disadvantaged by inadequate collaboration (Roter, 2000).

Our goal is to support the patient/provider collaboration needed to create effective plans for taking multiple medications, a common requirement for chronically ill elders. Developing multi-medication plans (schedules) imposes demands on provider and patient cognitive abilities. These plans must satisfy medication constraints (e.g., what medications can or cannot be taken together, or with food) as well as patient constraints (e.g., typical meal times and other aspects of daily schedule). Integrating medication and patient information in order to understand schedules can tax working memory (Day, 1988). Moreover, the collaborative work involved in jointly creating these plans (e.g., sharing information, proposing and critiquing schedules) may disrupt memory retrieval and other cognitive processes (Diehl & Stroebe, 1987).

External aids may support collaborative planning. According to distributed cognition theories (e.g., Zhang & Norman, 1994), performance emerges from the interaction of internal (mental) components and external task components. External representations may reduce reliance on mental processes involved in planning, such as integrating medication and patient information in working memory. Moreover, external representations may especially help older adults by reducing reliance on mental resources that decline with age (e.g., working memory, Salthouse, 1991). We investigated whether a medication table ("medtable", see Figure 1) that represents constraints between medications and daily events such as meals can support the collaborative planning involved in developing multi-medication schedules. While such representations improve memory and problem solving among individuals (Day, 1988; Zhang & Norman, 1994), their benefits for provider/patient collaboration have been little explored.

The medtable should support collaboration by providing an external workspace. For example, patients or providers can write down proposed medication-taking times, so their partner can easily see and refer to this information during discussion. In addition, the aid was

designed to direct partners' attention to problem-relevant constraints, for example by mapping medication times onto the patient's schedule (e.g., meal times). Constraints among multiple medications (e.g., which can be taken together and/or with meals) may be easily noticed when using this aid.

This type of structured aid has been used in a multi-component pharmacist-based patient education intervention designed to improve medication use by older adults with heart failure (Murray et al., 2007). We found that the intervention improved electronically monitored medication adherence. However, this study was not designed to disentangle the impact of the medtable on collaboration and self-care from other intervention components.

We are now refining the medtable and directly investigating its impact on patient/provider collaboration. Beginning in the laboratory, we have examined whether the medtable improves the ability to create multi-medication schedules in a simulated patient/provider collaboration task. In an earlier study, pairs of community-dwelling elders were randomly assigned to serve as provider or patient. The provider was given medication information (e.g., names, times to take, warnings for each medication), the patient received information about their daily schedule (work schedule, meal times), and the pair worked together to create schedules that satisfied medication and patient constraints. We compared problem-solving performance when participants used an earlier version of the medtable, blank paper (unstructured aid that controls for benefits of any external support), or no aid (talk only—similar to typical clinical situations; Aspden et al., 2007). We found that participants who either used the medtable or blank paper created more accurate schedules than those who did not use an aid, but that there was no difference between the two aid conditions. For example, participants who did not use an external aid created complex schedules that were only 52% correct on average, while those using either the medtable or paper created more accurate schedules (88% and 84%, respectively).

Daily Medication Schedule

	Wake Up	Breakfast			Lunch			Dinner		Bedtime
Times / Medications	:	:	:	:	:	:	:	:	:	:
1 Name: Instructions:										
2 Name: Instructions:										
3 Name: Instructions:										
4 Name: Instructions:										

Figure 1: Medtable aid

METHOD

The same simulated patient/provider consultation technique was used in the present study. The medtable was revised to more clearly relate medication and schedule constraints (see Figure 1), and was again compared to the paper condition. The no-aid condition was dropped from this study because the cost to problem solving of not having external support had been clearly demonstrated in the earlier study. Sixty-four community-dwelling older adults participated (Mean age=69 years; 16 pairs per aid group). Participants first practiced using the aid to create schedules that only involved two medications. They then performed two experimental trials that required creating more complex schedules with four medications each. One trial involved a simple patient schedule (typical work and meal times), while the other involved a more complex patient schedule (atypical work and meal times, with little flexibility for taking medications). Order of patient schedule complexity across the two trials was counterbalanced across pairs in each aid group. After participants created each schedule, the patient was asked to describe the schedule, which was audio-taped for later analysis. In addition to solution time, medication schedules were scored for accuracy (e.g., correct medication name, dose, whether medication times met dose spacing requirements and other constraints).

RESULTS

Figure 2 shows that participants using the medtable created more accurate multi-medication schedules than when they used paper, $F(1,30)=7.9$, $p<.01$. Patient complexity did not influence accuracy. Participants also created schedules more efficiently when using the medtable (6.7 vs. 8.9 sec per accuracy point, $F(1,30)=5.4$, $p<.05$). Efficiency was also reduced for more complex patient schedule problems (Simple= 6.8, Complex=8.8 sec per accuracy point, $F(1,29)=4.1$, $p=.05$), but this effect did not interact with aid ($p>.10$). Participants were presumably more accurate in the medtable condition because they wrote down more (accurate) information on the table when developing the schedule. This conclusion is supported by an analysis of the accuracy of information written on the aids, which paralleled the findings from the verbally reported schedules. We are analyzing the verbal protocols to explore how the two aids influenced collaborative processes such as proposing and critiquing schedules.

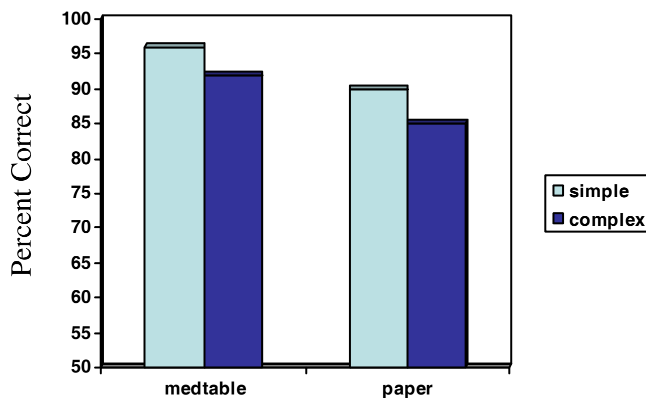

Figure 2: Mean Schedule Accuracy Scores (Percent Correct out of Total Points)

CONCLUSIONS

The findings from this study suggest that external aids support the collaboration needed to create effective patient-specific medication adherence plans. Benefits are greater for aids that are designed to support specific problem-solving processes (e.g., mapping medication onto patient schedule constraints). These aids may help structure collaborative work. Later studies will investigate whether such aids also improve collaboration and adherence in actual clinical settings. Finally, collaborative aids may be most effective if implemented electronically, so that they are easily configured for different types of patients and medications.

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