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Patient Compliance With and Attitudes Towards Health Buddy™

James H. Bigelow, Shan Cretin, Matt Solomon,
Shin-Yi Wu, Julie C. Cherry, Herb Cobb,
Michael O'Connell

RAND Health

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PREFACE

This report discusses patient acceptance of a device called Health Buddy™. Placed in the home of a chronically ill patient (in our example, one with congestive heart failure, or CHF), this device enables two-way communication between the patient and a care provider in a case management program. Health Hero, Inc., the company that developed the Health Buddy™ and offers the communication service based on it, writes:

> "The service is designed to give care providers the frequent communication and baseline data that yield more opportunities to identify potentially serious situations sooner, help caregivers focus their attention on those who need it most and enable them to motivate and educate their patients."

Communication occurs via Health Buddy™ when the patient responds to a short automated survey of perhaps a dozen questions. This is in contrast to most case management programs, where the case manager (usually a nurse) takes the initiative by telephoning the patient. Accordingly, the patient's acceptance of Health Buddy™ and his or her willingness to use it daily is crucial to its success.

This report should be of interest to any who contemplate establishing case management programs for chronically ill patients. Examples may be found in hospitals, independent practice associations, and health maintenance organizations. It should also interest those who, like Health Hero, offer services in support of case management programs.

Funding for this work was provided by Health Hero.

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SUMMARY

This report addresses patient acceptance of a new device called a Health Buddy™ used to communicate between patients chronically ill with congestive heart failure (CHF) and a health care provider (usually a nurse) in a case management program. The device (about the size of a clock radio) connects to the Internet with an ordinary telephone jack. Each day, the patient responds to a short automated survey of perhaps a dozen questions, by pressing buttons on the Health Buddy™. The completed survey is uploaded to the Health Hero[1] web site at a preset time (e.g., 3:00 AM), and simultaneously the next day's survey is downloaded. The next morning, the nurse retrieves and reviews the responses of all her cases, and intervenes as necessary.

Data suggest that the appropriate interventions can improve outcomes and reduce costs for CHF patients. Studies show reductions in mortality and hospital length of stay and likelihood of readmission [1-9]. Studies also show improved quality of life and functional status [4,6,10].

The literature cites two mechanisms for achieving these improved outcomes. First, the case manager monitors patient signs and symptoms (e.g., changes in weight, edema, shortness of breath, and fatigue), and notifies the patient's physician quickly of any abnormality. Physicians can respond to timely reports of symptoms, for example by adjusting a patient's medications or admitting the patient to the hospital [2,7]. Patients may consequently avoid a later, more lengthy and costly hospitalization.

Second, the case manager educates and motivates the patient to improve his or her compliance with prescribed medications, dietary restrictions (e.g., reduced sodium intake), and other behaviors (e.g., exercise, avoidance of alcohol and tobacco). Low medication and diet compliance rates are typical (30-60 percent [11]), and noncompliance is a substantial cause of heart failure decompensation and subsequent

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[1] Health Hero, Inc., developed the Health Buddy™ and markets the service based on the device.

hospitalization [12,13]. Studies have indicated improved compliance is associated with improved outcomes [3,10,14].

In most case management programs, the nurse communicates with patients by telephone no more frequently than once per week. By contrast, Health Buddy™ automates most of the communication between patient and case manager. If the patient uses his Health Buddy™ regularly, a case management program using Health Buddy™ should produce the same improvements in patient outcomes as telephone-based programs, and could conceivably product greater improvements due to its greater frequency of communication. Further, automating most of the contacts with the patient should reduce costs, because a single case manager should be able to manage more patients.

TWO BETA TEST SITES

We use data from two beta test sites to assess patient acceptance of Health Buddy™. Site A is an independent practice association of over 800 physicians that contracts with health insurance plans to provide medical care to insured individuals. Their Health Buddy™ case management program began around 3/31/99. Fifty-two patients installed Health Buddies™ and responded to at least one survey. Site B is a group of California hospitals. Site B began putting some patients from an existing case management program on Health Buddy™ in the middle of July 1999. Ninety-eight patients responded to at least one Health Buddy™ survey.

This report is based on three datasets from each site. First, we obtained data from each site on hospital admission and discharge dates of patients with a diagnosis of congestive heart failure (ICD9 code=428.x). These data covered all hospitalizations from well before the Health Buddy™ programs began until the ends of the respective study periods (8/30/99 for site A, 9/15/99 for site B).

Second, we obtained files of responses to Health Buddy™ surveys by all patients enrolled in the Health Buddy™ programs at the two sites. For each patient, these files contained all responses from the first time the patient used his Health Buddy™ through the ends of the study periods. We used these two datasets to assess patient compliance with Health Buddy™ surveys.

Third, we obtained a subset of responses by patients at the two sites regarding how the patient felt about the program. Most of these responses occurred after the ends of the study periods. We used these data to assess the ease of setting up and learning to use Health Buddy™, improvements in patients' understanding of CHF, and patients' attitudes towards Health Buddy™.

SETTING UP AND LEARNING TO USE THE HEALTH BUDDY™

The vast majority of patients who were asked reported that they found it easy to set up their Health Buddies™ and to learn to use them. For example, over 86 percent of respondents reported that they had no difficulty setting up the Health Buddy™ in their homes, and 92 percent took less than ten minutes to do so. Similarly large percentages of respondents reported that the instruction sets provided with or via the Health Buddy™ posed no difficulties.

PATIENT COMPLIANCE WITH HEALTH BUDDY™ SURVEYS

Failure of patients to respond to Health Buddy™ surveys may compromise patient outcomes and increase costs. While the Health Buddy™ is designed for daily contact with patients, a patient who only occasionally fails to respond may still be considered compliant. We therefore consider seven different compliance measures, namely the percentage of eligible days on which the patient's latest response was (1) yesterday, (2) the day before yesterday, … (7) seven days ago. Days on which the patient was hospitalized were not counted as eligible for a patient response.

As Figure S.1 shows, compliance rates exceed the 80 percent figure previously reported [2] for a case management program that, like Health Buddy™, required patients to take the initiative in communicating with the case manager. Patients miss about one day in eight or ten on the average, but they rarely miss more than two or three days in a row.

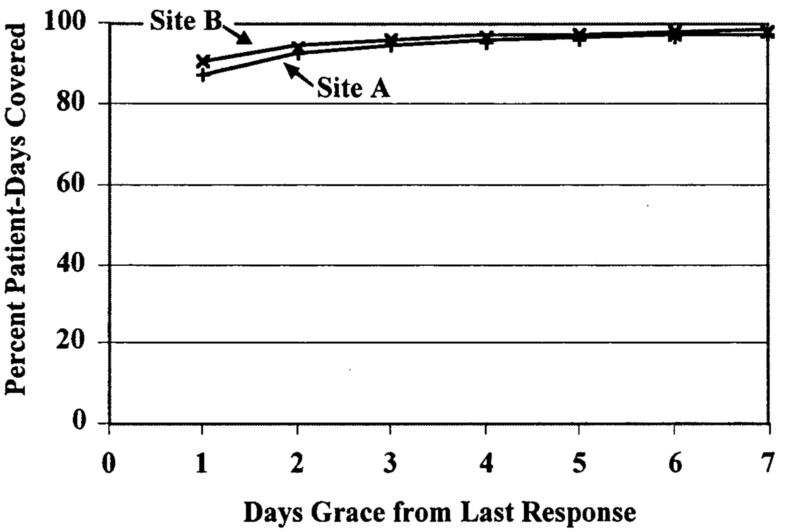

Figure S.1: Percent of Total Patient Days Covered by Health Buddy™ Responses

Rates of compliance with long-term regimens tend to be lower than with short-term regimens [15]. We saw no tendency for compliance rates to decline over time. However, "long-term" generally means a year or more, and the study period at site A (which had the longer of the two periods) covers less than six months. Thus this result, while promising, is not definitive.

IMPROVEMENTS IN PATIENTS' UNDERSTANDING AND MANAGEMENT OF THE DISEASE

The daily Health Buddy™ surveys included items intended to educate patients on how to care for themselves. Topics include medications (what do you take, and what is it for), diet (salt, sugar, alcohol, fat, cholesterol), monitoring oneself (weight, blood pressure, and symptoms such as shortness of breath or swelling in the tissues), and what your doctor needs to know.

From time to time a Health Buddy™ survey asked whether patients found items like these helpful. Almost all respondents said their diet compliance had gotten better or stayed the same since they received their Health Buddies™; only a handful reported that it had gotten worse. Patients also report that Health Buddy™ has a favorable effect on medication compliance. Most respondents report that participating in the program has given them a better understanding of their condition and more confidence in taking care of it. A substantial minority thinks that what they have learned from the Health Buddy™ program has helped communication with their physicians.

These results must be interpreted with caution. These are self-reports, and people have been known to shade the truth about what they eat and drink, and whether they follow their doctor's advice. It is clear that the "right" answer is "yes, I follow my diet," and some patients may have answered this way in order not to disappoint their case manager. Moreover, patients had to recall their diet and medication compliance prior to Health Buddy™ several months after the fact, and their recollections about something as ordinary as eating must be subject to considerable uncertainty.

ATTITUDES TOWARDS THE USE OF HEALTH BUDDY™

More than 90 percent of respondents at both sites report that their experience with the program is positive, and they are likely or very likely to continue using the Health Buddy™. About 70 percent of respondents reported that they did not want any changes made to Health Buddy™, but this leaves 30 percent who said they did want something changed. Unfortunately, no attempt was made to determine what they wanted to change. Follow-up of the "change" question may yield ideas for improving Health Buddy™.

SUMMARY OBSERVATIONS

The Health Buddy™ serves its purpose well as a communication and data link between the patient at home and the case manager. However, it remains a work in progress. We believe it can be improved in several ways.

Case managers at the two beta sites have not consistently followed up with the few patients who consistently do not respond to surveys, so we suggest that Health Hero remind the case managers to do so. Perhaps some patients can be persuaded to set up and use the device, but if not, their Health Buddies™ can be recovered and refurbished for use by others.

Health Hero can improve questions about ease of using Health Buddy™, its effect on patient understanding and management of their disease, and patient acceptance of the device. These questions are intended to identify shortcomings, on the basis of which Health Hero designs and implements improvements to Health Buddy™ protocols and surveys. Such questions will have greater utility if they are more concrete, focusing more on matters of fact and less on matters of judgement. The questions should also be less leading, and to the extent possible should not require patients to recall their behaviors from months before.

In this report we have considered patients' reports of how they use and benefit from Health Buddy™. But a complete assessment of a case management program depends on other factors as well. Is the case manager receiving the most useful information about the patient's signs and symptoms? Does she notify the patient's physician on the appropriate occasions? Does the physician respond to notifications in the best way? Have patient outcomes (e.g., mortality, frequency and length of hospitalizations functional status, quality of life) improved?

Simply asking patients more or different survey questions will not be sufficient to evaluate these aspects of Health Buddy™. Rather, Health Hero will have to gather data from case managers, physicians, and possibly hospitals and insurers. Following up on this suggestion is more difficult, as it requires a partnership between Health Hero and its clients and perhaps with third parties as well.

Finally, we recommend that Health Hero keep a mindset of continual improvement. The literature on case management identifies substantial disagreements about how and how well case management programs work. Thus Health Hero is not simply providing a product or service for which there is generally agreed methodology. Health Hero needs to keep abreast of advances made by others in case management practice and theory, and they should seek to contribute their own advances by monitoring and continually improving the case management programs of which they are a part.

1. INTRODUCTION

BACKGROUND

Studies suggest that case management can improve outcomes and reduce costs for patients with congestive heart failure (CHF) and other chronic conditions, by reducing mortality and hospital length of stay and likelihood of readmission [1-9]. Studies also show improved quality of life (e.g., as measured by SF-36 [16]) and functional status [4,6,10].

The literature cites two mechanisms for producing these improved outcomes. First, the case manager (usually a nurse) monitors patient signs and symptoms (e.g., changes in weight, edema, shortness of breath, and fatigue), and notifies the patient's physician quickly of any abnormality. Physicians can respond to timely reports of symptoms, for example by adjusting a patient's medications or admitting the patient to the hospital [2,7]. Patients may consequently avoid a later, more lengthy and costly hospitalization.

Second, the program seeks to reduce the incidence of adverse signs and symptoms by improving the patient's compliance with prescribed medications, dietary restrictions (e.g., reduced sodium intake), and other behaviors (e.g., exercise, avoidance of alcohol and smoking). Thirty to sixty percent is a typical range for the compliance rate with medications and diet, though the criteria (e.g., how one counts instances of partial compliance) vary from study to study [15,17,18]. By any criterion, however, noncompliance with medications and diet is a substantial cause of heart failure decompensation and subsequent hospitalization [12,13]. Programs attempt to improve compliance by educating the patient concerning the physiology of CHF and its symptoms, reasons for compliance and consequences of noncompliance, training on how to comply, and repeated encouragement, reassurance, reinforcement, and prompting. Studies have indicated that case management can improve compliance, though the reported size of the effect is usually modest

[6,9,11,14,15,17,19-21]. Further, improved compliance is associated with improved outcomes [3,10,14].

Different programs utilize different means of communicating with the patient. Cordisco [1] had the patient use a "DayLink monitor" to record data daily. Each day the monitor auto-dialed the nurse. Heidenreich [2] required the patient to call a toll-free number and report data to a computerized voice answering system by punching buttons on a touch-tone phone. In one program [21], the patient met face-to-face with various health care professionals in the hospital prior to discharge. The patient also received a 15 page teaching guide, at least one home care visit, and regular telephone contacts from the nurse. Fulmer [10] had the nurse telephone the patient and remind him/her to take his medications. Shah [7] paged the patient daily, providing a reminder to collect data and take medications. In addition written materials were mailed weekly, with each mailing followed by a telephone call from the nurse to discuss the written material, collect the week's data, and ask the patient about his/her clinical status. West [9] used an initial home visit, followed by regular telephone contacts for six weeks (or longer, for patients who had an ER or hospital visit during the first six weeks).

Health Hero has devised a new method for communicating between the patient and the nurse case manager. They place a device called a Health Buddy™ in the patient's home. The device (about the size of a clock radio) connects to the Internet with an ordinary telephone jack. Each day, the patient responds to a short automated survey of perhaps a dozen questions, by pressing buttons on the Health Buddy™. Completed surveys[2] are uploaded to the Health Hero web site at a preset time (e.g., 3:00 AM), and simultaneously the next day's survey is downloaded. The next morning, the nurse retrieves and reviews the responses of all her cases. Health Buddy™ surveys are designed to collect information about the patient's symptoms and behavior, and to provide some patient education via scripted quizzes. Only if one or more of a patient's

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[2] Partially completed surveys are not uploaded. Unless a patient completes all survey questions for a particular day, no answers will appear in the Health Hero database for that patient-day.

responses is "out of range" will the nurse follow up with a telephone call to that patient and, if indicated, an intervention. Logically, a case management program using this means of communication should produce the same improvements in patient outcomes as the programs cited above. It could conceivably yield greater improvements than programs that contact the patient only weekly or less often, due to its greater frequency of communication. Further, automating most of the contacts with the patient should reduce costs, because a single case manager should be able to manage more patients.

PURPOSE OF THE REPORT

The issue addressed in this report is, do patients find Health Buddy™ friendly and accessible, and do they consider it helpful in coping with their disease. Just because the device *can* make case management more efficient and/or effective does not guarantee that it *will* do so. For case management using Health Buddy™ to be effective, the daily surveys must ask the right questions, and the case manager must use the information to make the right decisions about when and how to intervene. But to make this possible, the patient must respond regularly to the Health Buddy™ surveys. The patient will not do so if s/he finds it difficult or annoying to use the device.

A comprehensive assessment of Health Buddy™ should also examine patient outcomes, such as survival and hospitalization rates. It should also estimate the monetary costs and savings of case management with Health Buddy™, in comparison to case management by other means. Unfortunately, we have too little data to support an assessment of these matters.

STRUCTURE OF THE REPORT

In this report we present results on this issue from CHF case management programs at two beta test sites for the Health Buddy™. Section 2 describes the two beta sites from which we have been able to collect information. Section 3 discusses patient reports of the ease of setting up the Health Buddy™ and learning to use it. Section 4 discusses patient compliance. That is, do patients respond to Health Buddy™ surveys reasonably frequently and reliably? Section 5 presents patient self-reports of the effect of Health Buddy™ on their understanding of their condition and their ability to manage it. Section 6 presents surveys of patient satisfaction with the Health Buddy™. Finally, Section 7 presents some summary observations.

2. CASE MANAGEMENT WITH HEALTH BUDDY™ AT THE BETA SITES

Site A, an Independent Practice Association

Site A is an independent practice association of over 800 physicians that contracts with health insurance plans to provide medical care to insured individuals. Prior to March 1998, site A offered no case management to CHF patients. At that time they contracted with an outside firm to provide CHF case management. The firm scanned site A's records and found 489 of their roughly 125,000 members who had been hospitalized or had visited an emergency room with a CHF-related diagnosis, and for whom an echocardiogram had been ordered. Case management was offered to all 489 CHF patients. The 139 patients who accepted began the program on various dates, ranging from 2/13/98 to 1/13/99.

Around 3/31/99 the program was replaced by Health Buddy™. Site A reviewed their records for the case managed patients, and contacted their doctors to determine which patients might benefit from continued case management. They offered Health Buddies™ to 81 patients, and sent Health Buddies™ to 55 patients. Fifty-two patients installed them and responded to at least one Health Buddy™ survey. Between the 3/31/99 transition and the end of the study period (8/30/99 at site A), no new patients were enrolled in the Health Buddy™ program, but twelve stopped responding and seven of these returned their Health Buddies™. Table 2.1 shows the age and gender makeup of patients at site A. Data are not available for other demographic characteristics (e.g., ethnicity, income, education). However, all patients spoke English.

Table 2.1

Age and Gender Makeup of Site A's Health Buddy™ Patients

	Patients who Responded through 8/30/99			Patients who Dropped Out Early		
Age	Female	Male	Total	Female	Male	Total
Minimum	56.0	52.9		55.5	62.5	
Average	73.6	72.8	73.1	70.8	72.8	71.8
Maximum	88.1	87.7		83.7	82.9	
Range						
50 - 59	2	2	4	1		1
60 - 69	3	7	10	2	2	4
70 - 79	7	11	18	2	3	5
80 - 89	3	5	8	1	1	2
Total	15	25	40	6	6	12

Site B, A Group of Hospitals

Site B is a group of California hospitals. About two years ago, site B began a case management program for CHF patients. Patients are recruited into the program as inpatients, by physician referral, or by self-referral, in decreasing order of frequency. Generally, patients in NY Heart Association risk class 1 or 2 stabilize after a few months and may then be dropped from case management. Class 3 and 4 patients remain in the program indefinitely.

Site B began putting some patients from their existing case management program on Health Buddy™ a few months before this writing, and they began receiving responses to Health Buddy™ surveys in the middle of July, 1999. Initially they sent 116 Health Buddies™ to patients. Four were returned, leaving 112 boxes in the field. Of these, 98 responded at least once to the Health Buddy™ surveys and as of the end of the study period (September 15, 1999 for site B), none had returned the boxes. Five of the 98 patients stopped responding within ten days, and another six stopped responding within about six weeks. Eighty-seven patients continued to respond to Health Buddy™ surveys through the study period's end. Table 2.2 shows the age and gender makeup of the site B patients. As at Site A, data are not available on other demographic characteristics, save that all patients spoke English.

Table 2.2

Age and Gender Makeup of Site B's Health Buddy™ Patients

	Patients who Responded through 9/15/99			Patients who Dropped Out Early		
Age	Female	Male	Total	Female	Male	Total
Minimum	45.2	43.3		68.8	68.8	
Average	70.7	72.5	71.6	75.1	73.7	74.5
Maximum	88.4	95.0		85.2	81.3	
Range						
40 - 49	2	3	5			
50 - 59	4	6	10			
60 - 69	12	7	19	1	1	2
70 - 79	14	16	30	2	1	3
80 - 89	9	10	19	1	1	2
≥ 90		3	3			
Missing			1			4
Total	41	45	87	4	3	11

Data

This report is based on three datasets from each site. First, we obtained data from each site on hospitalizations of patients with a diagnosis of congestive heart failure (ICD9 code=428.x). These data covered all hospitalizations from well before the Health Buddy™ programs began until the ends of the respective study periods (August 30, 1999 for site A, September 15, 1999 for site B). For each hospitalization, we could identify the patient hospitalized, and we made use of the admission date and discharge date.

Second, we obtained files of responses to Health Buddy™ surveys by all patients enrolled in the Health Buddy™ programs at the two sites. For each patient, these files contained all responses from the first time the patient used his Health Buddy™ through the ends of the study periods.

Third, we obtained a subset of responses by patients at the two sites regarding how the patient felt about the program. Most of these responses occurred after the ends of the study periods. Was it easy to set up and learn to use the Health Buddy™? Had participating in the program improved the patient's understanding of his condition and his ability to manage it? These data include responses by some patients who enrolled in the programs after the study periods. However, we will confine our attention to data from patients who were included in Tables 2.1 and 2.2.

We used data on hospitalizations and Health Buddy™ responses during the study period (the first two datasets) for each site to assess patient compliance with Health Buddy™ surveys (Section 4). Our report of patient compliance, therefore, does not cover the period beyond the end of the study period at either site. Our assessments of the ease of setting up and learning to use Health Buddy™ (sections 3), improvements in patients' understanding of CHF (section 5), and patients' attitudes towards Health Buddy™ (section 6) are based on responses to selection Health Buddy™ survey questions obtained after the study period for each site (the third dataset).

3. SETTING UP AND LEARNING TO USE THE HEALTH BUDDY™

About a month after they received their Health Buddies™, most site B patients were asked a series of five questions about whether they had any difficulty setting it up or learning how to use it. None of the 52 site A patients in the study were asked the first four questions. The last question in this group was asked of patients at both site A and site B. At site A it was asked approximately five months after patients had received their Health Buddies™. At site B the question was asked at approximately the one-month mark. It was repeated for most site B patients at about three months, and almost no answers changed. These were the five questions:

3.1: Did you have any difficulties setting up Health Buddy™ in your home?

3.2: How long did it take to set up the Health Buddy™ in your home?

3.3: Were the instructions that came with the Health Buddy™ clear and easy to understand?

3.4: Did you have any difficulty completing the initial training instructions on the Health Buddy™ screen?

3.5: After reading the instructions, have you had any difficulty using the Health Buddy™ to answer the daily questions?

The vast majority of patients reported that they found it easy to set up their Health Buddies™ and to learn to use them. Over 86 percent of respondents reported that they had no difficulty setting up the Health Buddy™ in their homes (question 3.1), and 92 percent took less than ten minutes to do so (question 3.2). Similarly large percentages of respondents reported that the instruction sets provided with or via the Health Buddy™ posed no difficulties (questions 3.3-3.5). The details appear in Tables 3.1 through 3.5.

However, a small proportion had some difficulties. Recall also that 5 patients at Site A and 14 patients at Site B received Health Buddies™ but didn't respond to any of the surveys. It is possible that some of these were unable to set up the Health Buddy™, so Tables 3.1 through 3.5 may understate the proportion who actually had difficulties.

At the time these data were collected, Health Hero's policy was to deliver the Health Buddy™ to the patient's home via Federal Express and rely on the case manager to follow up with patients who have difficulty setting up the Health Buddy™. Because the case managers have not consistently done so, Health Hero is now beginning to remind the case manager when follow up is necessary.

Table 3.1:

"Did you have any difficulties setting up Health Buddy™ in your home?"

	Site B Patients			
	Number of Patients		Percent of patients	
	Include Dropouts	Exclude Dropouts	Include Dropouts	Exclude Dropouts
No difficulty	80	76	86	87
Yes, had difficulty	13	11	14	13
Total asked	93	87	100	100
Not Asked	5	-		

Table 3.2:

"How long did it take to set up the Health Buddy™ in your home?"

	Site B Patients			
	Number of Patients		Percent of patients[1]	
	Include Dropouts	Exclude Dropouts	Include Dropouts	Exclude Dropouts
1 minute or less	4	4	4	5
2 - 5 minutes	45	42	48	48
6 - 10 minutes	37	35	40	40
11 - 15 minutes	1	4	1	1
16 - 20 minutes	4	3	4	3
20 minutes or more	2	2	2	2
Total asked	93	87	99	99
Not asked	5	-		

[1] May not add to 100 percent due to rounding

Table 3.3:

"Were the instructions that came with the Health Buddy™ clear and easy to understand?"

	Site B Patients			
	Number of Patients		Percent of patients	
	Include Dropouts	Exclude Dropouts	Include Dropouts	Exclude Dropouts
Yes, clear and easy	84	79	90	91
No, not clear	9	8	10	9
Total asked	93	87	100	100
Not asked	5	-		

Table 3.4:

"Did you have any difficulty completing the initial training instructions on the Health Buddy™ screen?"

	Site B Patients			
	Number of Patients		Percent of patients	
	Include Dropouts	Exclude Dropouts	Include Dropouts	Exclude Dropouts
No difficulty	91	85	98	98
Yes, had difficulty	2	2	2	2
Total asked	93	87	100	100
Not asked	5	-		

Table 3.5:

"After reading the instructions, have you had any difficulty using the Health Buddy™ to answer the daily questions?"

	Site A Patients		Site B Patients	
	Include Dropouts	Exclude Dropouts	Include Dropouts	Exclude Dropouts
	Numbers of Patients			
No difficulty	37	36	90	85
Yes, had difficulty	-	-	3	2
Total asked	37	36	93	87
Not asked	15	4	5	-
	Percent of Patients Asked			
No difficulty	100	100	97	98
Yes, had difficulty	-	-	3	2
Total asked	100	100	100	100

4. PATIENT COMPLIANCE WITH HEALTH BUDDY™ SURVEYS

As used in this section, compliance measures the fraction of days that patients respond to Health Buddy™ surveys. We are interested in compliance for two reasons. First, low compliance may compromise outcomes. If a patient fails to respond to the surveys, his or her condition may deteriorate unbeknownst to the case manager. The patient may need hospitalization, which might have been avoided had the case manager had timely information. Second, low compliance may increase case management costs. When the patient fails to respond to a Health Buddy™ survey, the case manager may telephone the patient to obtain the information. Of course, there is a tradeoff between these two factors. If the case manager obtains the information via telephone, the patient will avoid worse outcomes.

In many-perhaps most-case management programs, the case manager calls the patient, so this form of compliance is not an issue. But one study we found [2] required the patient to dial a toll-free number and report data to a computerized voice answering system. This study reported a compliance rate of over 80 percent for daily data entry, for a group of 68 patients followed for 7.4 months on average, though the compliance rate was not precisely defined. This 80 percent figure may serve as a standard of comparison for Health Buddy™.

This section examines only compliance with the task of responding to Health Buddy™ surveys. In the next section we present some limited data on patient reports of other forms of compliance, namely compliance with medication and diet.

Alternative Compliance Measures

We define several measures of compliance with Health Buddy™ surveys. They are all ratios of the number of days a patient or group of patients has provided adequately timely information by answering a

Health Buddy™ survey, to the number of days which ought to be covered by such information.[3]

We define the denominator of this ratio (i.e., the days that ought to be covered) as the number of patient-days that the patients have Health Buddies™ and are not hospitalized.

While the Health Buddy™ is designed for daily contact with patients, from a case management perspective, a patient who occasionally fails to respond may still be considered compliant. We therefore consider seven different definitions for the numerator of the ratio (i.e., the days covered by a patient response). According to these definitions, a day is covered if the most recent patient response occurred today (definition 1), yesterday (definition 2), on up to six days ago (definition 7). Because the nurse case manager receives a patient's response the day after he or she makes it, under definition 'n' the case manager will have information that is no more than 'n' days old. Clearly, the longer it has been since the patient has responded, the more time there has been for his condition to deteriorate, and the greater the risk of compromised outcomes.

Patients Who Dropped Out Early

As mentioned earlier, 12 of 52 patients from site A and 11 of 98 from site B stopped responding to Health Buddy™ surveys before the end of the study periods. In addition, three patients from site A and 14 from site B received Health Buddies™ but never responded; these patients are not included in the calculation of compliance rates.

Some patients did not complete the study for reasons that have nothing to do with compliance. Case manager notes from site A give reasons why five of the 12 patients did not complete the study, including switching physicians (1 patient), switching plans (2 patients), moving to another city (1 patient), and physician not signing patient up (1 patient). We can speculate that some patients dropped out because they were sent to skilled nursing facilities (SNF) or died. On

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[3] Patients did not have the option of skipping some of the questions on a Health Buddy™ survey. Unless a patient answered all the questions, nothing would be uploaded to the Health Hero database for that day.

the other hand, some patients who dropped out early or never responded should be considered non-compliant. They may have decided that they "can't be bothered to fiddle with electronic gimcrackery," or they may have been intimidated by the task of installing the Health Buddy™ (though as described earlier, most patients seemed to find it easy).

Data on Days to Cover

For each patient we include in our compliance rate computation (40 patients from site A, 87 from site B), we take the first day to cover as the first day on which the patient responded to a Health Buddy™ survey. Patients could have received their Health Buddies™ earlier, however, as we have no independent data showing when the box was received.

We take the last day to cover to be the end of the study period (August 30, 1999 for site A, and September 15, 1999 for site B).

We assumed that Health Buddy™ information did not need to cover any day that a patient spent in a hospital or SNF, since for that day the patient would be monitored by nurses at the facility. From both sites we obtained data on all stays in hospital and SNF for which one of the admitting diagnoses was CHF (ICD9 code=428.x). It is possible that patients were hospitalized for other reasons during the study period-indeed, case manager notes from site A suggest that this happened on a couple of occasions. Since a patient won't respond to Health Buddy™ surveys while in hospital for any reason, omitting non-CHF hospitalizations should lead to an underestimate of compliance.

Data on Days Covered

Health Hero provided data on responses to Health Buddy™ surveys from all patients. Each response is stamped with the date and time at which the patient completed the survey. We assigned the vast majority of responses to the date with which they were stamped. Sometimes, however, two responses were stamped with the same date, one at an early morning hour (e.g., 3:00 AM) and one at a more conventional hour (e.g., 10:00 AM or 1:00 PM). In such a case we assigned the 3:00 AM response to the previous day, assuming the patient had had a late night.

Compliance Results

Figure 4.1 shows the percent of patient-days covered at the two sites as a function of how old the latest response can be and still cover a day. A patient-day needs to be covered if the patient has a Health Buddy™ and is not in a hospital or SNF. Patients miss about one day in eight or ten on the average, thought they rarely miss more than two or three days in a row.

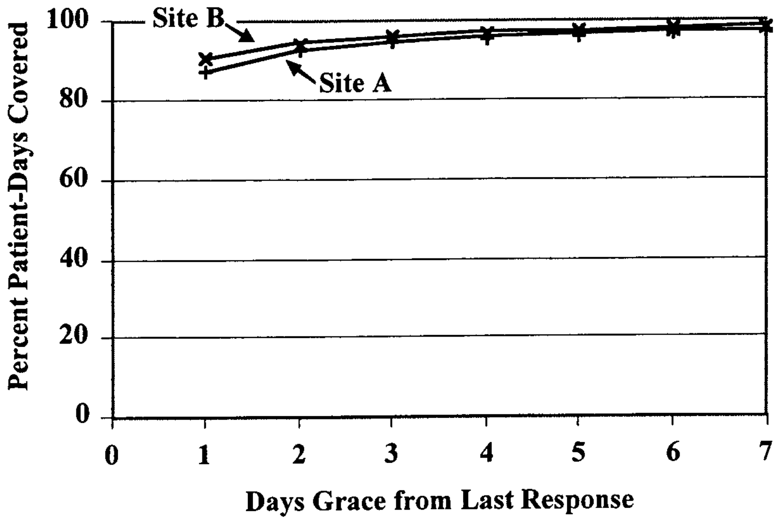

Figure 4.1: Percent of Total Patient Days Covered by Health Buddy™ Responses

The data for Figure 4.1 appear in Table 4.1.

Table 4.1:

Percent of Total Patient Days at Site A Covered by Health Buddy™ Responses

	Days Grace from Last Response						
	1	2	3	4	5	6	7
Site A	87.1	92.4	94.4	95.4	96.1	96.7	97.2
Site B	90.5	94.2	95.8	96.7	97.2	97.7	98.1

Rates of compliance with long-term regimens tend to be lower than with short-term regimens [15]. As Table 4.2 shows, the compliance rate at site A (the site with the longer study period) looks very flat over time, with just a bit of random looking variation from month to month.

However, "long-term" generally means a year or more, and the study period at site A covers less than six months. Thus the results in Table 4.2, while promising, are not definitive.

Table 4.2:

Percent of Total Patient Days at Site A Covered by Health Buddy™ Responses, By Month

	Days Grace from Last Response						
Period	1	2	3	4	5	6	7
3/15 - 4/30	91.0	95.4	96.5	97.2	97.9	98.5	99.0
5/1 - 5/31	86.6	90.8	92.8	93.8	94.6	95.2	95.7
6/1 - 6/30	88.2	94.0	95.7	96.3	96.8	97.2	97.5
7/1 - 7/31	82.5	89.4	92.4	94.1	94.8	95.4	95.9
8/1 - 8/30	87.4	92.7	94.6	95.6	96.6	97.3	97.8

Summary of beta site compliance

Overall, the analysis of the data from both sites points to a high level of patient acceptance and use of the Health Buddy™ device, provided the patient is able to connect the device and use it at least once. The compliance rate compares favorably to the 80 percent figure reported by Heidenreich et al [2]. Patients who stay with the program tend to be quite consistent in their use of the device. Further analysis on who drops out and why could be helpful.

5. IMPROVEMENTS IN PATIENTS' UNDERSTANDING AND MANAGEMENT OF THE DISEASE

A patient's outlook may be much improved if he can learn why and how to manage his condition. Reported compliance rates with medications and diet are typically 30-60 percent [15,17,18], and noncompliance with medications and diet is a substantial cause of heart failure decompensation and subsequent hospitalization [12,13]. Case management can improve compliance [6,9,11,14,15,17,19-21], and improving compliance is associated with improved outcomes [3,10,14].

The daily Health Buddy™ surveys included items intended to educate patients on how to care for themselves. Topics include medications (what do you take, and what is it for), diet (salt, sugar, alcohol, fat, cholesterol), monitoring oneself (weight, blood pressure, blood sugar-for diabetics, and symptoms such as shortness of breath or swelling in the tissues), and what your doctor needs to know. For example, patients were asked regularly about their salt intake, and informed about the amount of salt in various foods. They were advised to read labels on food packages. They were asked to identify any ACE inhibitors, diuretics, and beta-blockers they were taking, and informed about possible side effects. Diabetics were questioned about their blood sugar, how well they kept to their diets, and how and how well the administered themselves insulin. Patients were queried about when it was appropriate to seek medical help, and who to call. One of the sites queried patients about whether they felt increased stress or depression, whether their condition was limiting their daily activities, and whether they had enough money for food, clothing, medicines, etc.

From time to time a Health Buddy™ survey asked whether patients found items like these helpful. The following are their responses.

Diet Compliance

Two questions check diet compliance before and after the Health Buddy™ program started.

5.1a: Were you adequately following an appropriate Heart Failure diet prior to Health Buddy™ Heart Failure Program?

5.1b: Since starting Health Buddy™ Heart Failure program, are you now adequately following an appropriate Heart Failure diet?

At site A, these questions were asked of most patients two, five, and eight months after the patient enrolled in the program. The results at all times are quite similar, except that the number of responses dropped off at month eight. At site B, the questions were asked once, at month three.

The patients' responses suggest a definite improvement in compliance with diet recommendations (Table 5.1). About three of four respondents reported that they always or usually followed their diet before the program, while about nine of ten said they followed it after the program started. Almost all respondents said their diet compliance had gotten better or stayed the same; only a handful reported that it had gotten worse.

This result must be interpreted with caution. Certainly it is possible that patients' compliance with dietary restrictions have improved. However, these are self-reports, and people have been known to shade the truth about what they eat and drink. It is clear that the "right" answer is "yes, I follow my diet," and some patients may have answered this way in order not to disappoint the nurse case manager. Moreover, question 5.1a (concerning diet prior to Health Buddy™) requires patients to recall their diets from several months earlier, and their recollections about something as ordinary as eating must be subject to considerable uncertainty.

Survey questions addressing this issue could be improved. Instead of asking "are you following your diet," one could ask "what did you eat yesterday," a question that is less leading and calls for a more concrete answer. Moreover, one should not rely on the patients' memories of their pre-Health Buddy™ diets. They should be asked about their diets when they first enroll in the case management program. Even with these improvements, however, the patients' responses would still be self-reports. However, as discussed in Meichenbaum and Tuck, p. 32-35 [18], self-reports can be fairly good statistical predictors of compliance. In addition, the very act of self-reporting is thought to improve compliance under some circumstances.

Table 5.1:

"Were you adequately following an appropriate Heart Failure diet prior to Health Buddy™ Heart Failure Program?"

"Since starting Health Buddy™ Heart Failure program, are you now adequately following an appropriate Heart Failure diet?"

	Number of Patients			
	Site A Patients[1] Excluding Dropouts		Site B Patients Excluding Dropouts	
	Before	After	Before	After
Always	8	12	23	29
Usually	21	23	32	37
Sometimes	7	5	11	2
Not at all	4	-	3	1
Total asked	40	40	69	69
Not asked	-	-	18	18
	Direction of Change			
Got better	11		22	
Stayed the same	29		41	
Got worse	-		6	
Total asked	-		69	
Not asked	40		18	
	Percent of Patients Asked[2]			
	Site A Patients[1] Excluding Dropouts		Site B Patients Excluding Dropouts	
	Before	After	Before	After
Always	20	30	33	42
Usually	53	58	46	54
Sometimes	18	13	16	3
Not at all	10	-	4	1
Total asked	101	101	99	100
	Direction of Change			
Got better	28		32	
Stayed the same	73		59	
Got worse	-		9	
Total asked	101		100	

[1] Data tabulate responses at month five. Responses at months 2 and 8 are similar

[2] May not add to 100 percent due to rounding.

Medication Compliance

A number of questions explore the effect of the Health Buddy™ programs on patient compliance with medications (Tables 5.2 and 5.3). The first of these questions, here labeled 5.2a, was put to patients at site A two, five, and eight months after they enrolled in the program. Patients at site B were asked question 5.2a once, three months after enrollment.

5.2a: Prior to starting the Health Buddy™ CHF Program, did you ever tend to miss medication doses?

Most patients at both sites replied "No," they had not tended to miss medication doses prior to the Health Buddy™ program. When "No" was the response, there was no exploration of just what patients meant. But when a patient responded "Yes" to question 5.2a, it was followed up with question 5.2b.

5.2b: Since the Health Buddy™ CHF Program began, have you been taking your medications more regularly?

Patients invariably responded "Yes" or "Somewhat" to this question, suggesting that they felt Health Buddy™ helped them to comply better with their medication regimes.

Patients at site A were asked yet another medication compliance question, this one about one month after enrollment.

5.3: Are you taking your medications more regularly as a result of this program?

Unlike question 5.2a, this allowed a patient to report improvement even if he or she felt his compliance had been pretty good before the program. Indeed, 18 patients who responded "No" to question 5.2a reported that they took their medications more regularly or somewhat more regularly in response to question 5.3.

Responses to these questions suggest that Health Buddy™ programs have a favorable effect on medication compliance, but this result must be treated with caution for all the reasons we cited above regarding the diet compliance results. The questions can be improved by making them less leading and more concrete. The current questions assume compliance stays the same or improves, and should be rephrased to permit the answer that medication compliance has gotten worse. Patients should be given an opportunity to elaborate on a "No" answer to question 5.2a. For example, they could be asked whether not tending to miss doses means never missing doses, or only missing doses once or twice a week, or taking all the doses but not on the physician's schedule. Questions could be made more factual, for example asking for dates on which prescriptions are actually filled, or lists of drugs and dosages actually taken that day. Finally, the questions about compliance before

Health Buddy™ rely on patients to recall their compliance from months earlier. Compliance questions should be asked when the patient first enrolls in the Health Buddy™ program to establish a baseline.

Table 5.2:

"Prior to starting the Health Buddy™ CHF Program, did you ever tend to miss medication doses?"

	Site A, No Dropouts			Site B, No Dropouts
	2 months	5 months	8 months	3 months
	Number of Patients			
Yes[1]	6	6	3	5
No	34	34	30	64
Total asked	40	40	33	69
Not asked	-	-	7	18
	Percent of Patients Asked			
Yes[1]	15	15	9	7
No	85	85	91	93
Total asked	100	100	100	100

[1] Patients responding "Yes" were then asked question 5.2b: "Since the Health Buddy™ CHF Program began, have you been taking your medications more regularly?" All answered "Yes" or "Somewhat."

Table 5.3:

"Are you taking your medications more regularly as a result of this program?"

	Site A at 1 Month No Dropouts	
	Number	Percent[1]
Yes	18	45
Somewhat	5	13
No	16	40
Not sure	1	3
Total asked	40	101
Not asked	-	

[1] May not add to 100 percent due to rounding

Understanding and Confidence

Two questions asked patients about their understanding of their disease, and their confidence in taking care of their condition (Tables 5.4 and 5.5):

5.4: Do you believe you have a better understanding of heart failure and how to manage your condition based on this program?

5.5: Do you feel more confident in taking care of your condition as a result of this program?

Patients at site B were asked only question 5.4, and they were asked it only once, about three months after they joined the program. Patients at site A were asked both questions, and they were asked on four occasions, approximately one, two, five, and eight months after joining the program. All responses at site B and almost all at site A were from patients who remained in the program through the end of the study period, and the tables contain only their responses. Responses from dropouts are excluded.

Most respondents report that participating in the program has given them a better understanding of their condition and more confidence in taking care of it. Moreover, the site A results indicate that their feelings in this regard have not changed markedly over time. They gained their improved understanding and confidence within the first month, and have not lost their early gains as time has passed.

Table 5.4:

"Do you believe you have a better understanding of heart failure and how to manage your condition based on this program?"

	Site A No Dropouts				Site B No Dropouts
	1 month	2 months	5 months	8 months	3 months
	Number of Patients				
Yes	28	30	28	23	55
Somewhat	10	7	9	10	13
No	-	2	1	-	-
Not sure	2	1	2	-	1
Total asked	40	40	40	33	69
Not asked	-	-	-	7	18
	Percent of Patients Asked[1]				
Yes	70	75	70	70	80
Somewhat	25	18	23	30	19
No	-	5	3	-	-
Not sure	5	3	5	-	1
Total asked	100	101	101	100	100

[1] May not add to 100 percent due to rounding.

Table 5.5:

"Do you feel more confident in taking care of your condition as a result of this program?"

	Site A Patients, Excluding Dropouts			
	1 month	2 months	5 months	8 months
	Number of Patients			
Yes	17	15	16	13
Somewhat	17	20	20	18
No	2	2	1	1
Not sure	4	3	3	1
Total asked	40	40	40	33
Not asked	-	-	-	7
	Percent of Patients Asked[1]			
Yes	43	38	40	39
Somewhat	43	50	50	55
No	5	5	3	3
Not sure	10	8	8	3
Total asked	101	101	101	100

[1] May not add to 100 percent due to rounding.

Communication Between Patient and Physician

Table 5.6 examines changes in the patient's assessment of the quality of communication with his or her physician. Data are shown only for patients who remained in the program through the end of the study period. Almost no patients feel that what they have learned from the Health Buddy™ program has hurt communication with their physicians. A substantial minority thinks it has helped.

Table 5.6:

"Since using the Health Buddy™ how satisfied have you been with communication between you and your doctor?"

	Site A, No Dropouts	Site B, No Dropouts	
	4 months	1 month	3 months
	Number of Patients		
More satisfied	13	35	41
No difference	20	48	35
Less satisfied	1	3	5
Total asked	36	86	81
Not asked	6	1	6
	Percent of Patients Asked		
More satisfied	38	41	51
No difference	59	56	43
Less satisfied	3	3	6
Total asked	100	100	100

6. ATTITUDES TOWARDS THE USE OF HEALTH BUDDY™

Some Health Buddy™ surveys asked patients three questions to probe their general attitudes towards the program. The questions were:

6.1: How likely are you to continue to use the Health Buddy™ in the future?

6.2: Is there anything you would change about the Health Buddy™ that would improve your experience with it?

6.3: All things considered, has your experience with Health Buddy™ been positive neutral, or negative?

Site A patients received these questions about five-months after they entered the program, though for some the questions came at about eight months. Patients at site B were asked them first about one month after they enrolled in the program.

More than 90 percent of respondents at both sites report that their experience with the program is positive (question 6.3), and they are likely or very likely to continue using the Health Buddy™ (question 6.1). Most site B patients were asked question 6.1 again after approximately three months. Twelve responded more positively the second time, and thirteen more negatively, but only a handful changed their response by more than one step.

About 70 percent of respondents to question 6.2 reported that they did not want any changes made to Health Buddy™, but that leaves 30 percent who said they did want something changed. No attempt was made to determine what they wanted to change. Follow-up of the "change" question could be an important source of ideas for improving Health Buddy™.

Tables 6.1 - 6.3 provide details.

Table 6.1:

"How likely are you to continue to use the Health Buddy™ in the future?"

	Site A Patients		Site B Patients	
	Include Dropouts	Exclude Dropouts	Include Dropouts	Exclude Dropouts
	Number of Patients			
Very likely	25	25	54	51
Likely	9	8	29	26
Somewhat likely	2	2	3	3
Not very likely	-	-	4	4
Not at all likely	-	-	1	1
Don't know	-	-	2	2
Total asked	36	35	93	87
Not asked	16	5	5	-
	Percent of Patients Asked			
Very likely	69	71	58	59
Likely	25	23	31	30
Somewhat likely	6	6	3	3
Not very likely	-	-	4	5
Not at all likely	-	-	1	1
Don't know	-	-	2	2
Total asked	100	100	99	100

[1] May not add to 100 percent due to rounding.

Table 6.2:

"Is there anything you would change about the Health Buddy™ that would improve your experience with it?"

	Site A Patients		Site B Patients	
	Include Dropouts	Exclude Dropouts	Include Dropouts	Exclude Dropouts
	Number of Patients			
No, don't change	23	22	68	63
Yes, change	13	13	25	24
Total asked	36	35	93	87
Not asked	16	5	5	-
	Percent of Patients Asked			
No, don't change	64	63	73	72
Yes, change	36	37	27	28
Total asked	100	100	100	100

Table 6.3:

"All things considered, has your experience with Health Buddy™ been…?"

	Site A Patients		Site B Patients	
	Include Dropouts	Exclude Dropouts	Include Dropouts	Exclude Dropouts
	Number of Patients			
Positive	32	31	11	11
Neutral	4	4	1	1
Negative	-	-	-	-
Total asked	36	35	12	12
Not asked	16	5	86	75
	Percent of Patients Asked			
Positive	89	89	92	92
Neutral	11	11	8	8
Negative	-	-	-	-
Total asked	100	100	100	100

7. SUMMARY OBSERVATIONS

In this section, we discuss some opportunities to improve Health Buddy™. Overall, patients like their Health Buddies™. Few have difficulty setting up the device and learning to use it, and most use it almost daily. Thus the Health Buddy™ serves its purpose well as a communication and data link between the patient at home and the case manager.

However, Health Buddy™ remains a work in progress. We believe it can be made better in the following ways.

Can the Dropouts be Prevented?

Some patients never responded to a single survey. We can only speculate why, but possibly they were intimidated by the task of setting up the device, or antagonistic towards new technology. Similar reasons may account for a few patients responding once or twice and then quitting, though some patients quit because they moved out of the area, or switched to a physician or a health plan that was not participating in the program. The question arises, then, whether there is anything Health Hero can do to prevent these dropouts.

Health Hero currently sends Health Buddies™ to patients via Federal Express, but relies on the case manager to follow up with patients who never attempt the initial instructions. Health Hero also expects the case manager to follow up with patients who have stopped responding. However, the case managers at the two beta sites have not done so consistently. We suggest, therefore, that Health Hero should remind and encourage the case managers to follow up with these patients. It may be possible to persuade or teach some patients to set up and use the device, and they may come to like it. Health Buddies™ can be recovered from those who will not use them (whatever the reason), and refurbished for use by another patient.

Improving Health Buddy™ Survey Questions

Health Hero included the questions of Sections 3, 5, and 6 in Health Buddy™ surveys in order to support efforts to improve Health

Buddy™. The questions are intended to identify shortcomings, on the basis of which Health Hero designs and implements changes to Health Buddy™ protocols and surveys. Then the same questions are asked again of both old and new patients, to support another cycle of improvement.

As noted earlier, the questions on patient compliance with medications and dietary restrictions can themselves be improved. They should be more concrete, so patients' answers are more matters of fact and less matters of judgement. For example, instead of asking the patient whether he is following an appropriate Heart Failure diet, one should ask the patient specifically what he eats, and how much salt he adds to his food either during cooking or at the table. This approach will turn one question into several, but the answers should be more reliable. The questions should also be less leading, and to the extent possible should not require patients to recall their behaviors from months before.

The Educational Role of Health Buddy™

Literature cited earlier reports that education can improve compliance with medications and diet, and that improving compliance is associated with improved outcomes. Thus it may improve patient outcomes to exploit Health Buddy's™ potential for educating the patient concerning the physiology of CHF and its symptoms, reasons for compliance and consequences of noncompliance, training on how to comply, and repeated encouragement, reassurance, and reinforcement. As discussed in Section 5, current Health Buddy™ surveys include a number of questions intended for this purpose.

Health Buddy™ surveys can provide feedback and individualized instruction, both of which are considered to make education much more effective [15]. It can present the patient with a different survey each day. Moreover, each survey can be designed so that a particular answer to one question (e.g., answering "yes" to "do you have any new swelling, or any more swelling in your feet or legs than usual today?") can trigger a follow-up question or comment (e.g., "Limiting sodium intake may help prevent excess fluid accumulation in the body.").

Patients report that Health Buddy™ is helping them to understand their condition better and to manage it better as well. This is promising, though the data are not sufficient to demonstrate that actual patient outcomes (e.g., number and length of hospitalizations) have improved.

Improving Other Aspects of Health Buddy™ Programs

Survey questions directed at patients cannot probe all aspects of Health Buddy™ use. As discussed earlier, there are two mechanisms by which case management programs seek to improve patient outcomes. One mechanism is to improve the patient's compliance with medications, diet restrictions, and other medical advice. Survey questions can probe how well this mechanism is operating. The other mechanism is to monitor the patient, and quickly notify the physician of signs of deterioration. If the physician can intervene early, perhaps he can fix the problem before it grows. Survey questions directed at patients are a poor means for assessing the effectiveness of this mechanism.

Health Hero can play a role in assessing this mechanism, though they cannot do it alone. Though barely mentioned in this report, Health Hero collects all patient responses to every Health Buddy™ survey. "Out of range" responses are flagged, but Health Hero currently makes no attempt to determine how the case manager responds to flagged responses. In particular, Health Hero does not know when the patient's physician is notified, nor what the physician does in response. Case managers and physicians would have to provide these data.

Given these data, however, one could assess the process by which a patient's signs and symptoms provoke a medical intervention such as an adjustment of medications or hospitalization. One could judge whether the case managers receive the right information and react to by notifying physicians when it is correct to do so and not notifying them when it is unnecessary. One could judge whether physicians receive the right information when they are notified, and whether they respond in the best way. And based on this assessment, any or all of the steps in the process might be improved, from the information on signs and symptoms collected by Health Buddy™ surveys, to how the information is presented to the case manager, to case manager protocols and physician guidelines.

Ultimately, the value of Health Buddy™ depends on its effect on patient outcomes, such as numbers and lengths of hospitalizations, and patient survival rates, functional status, and quality of life. Collecting most patient outcome data will require extraordinary efforts by Health Hero in cooperation with some combination of hospitals, physicians, hospitals, and insurers. However, Health Hero could include questions on quality of life and functional status in some Health Buddy™ surveys. The Short Form 36 (SF-36) survey [16] is a possible source of 36 questions, which could be included a few at a time (to avoid adding too much length) in successive surveys.

Concluding Comments

We have made some suggestions in this section on how to improve Health Buddy™ programs. Some of the suggestions are fairly straightforward for Health Hero to implement, as Health Hero could carry them out alone. Following up on other suggestions is more difficult, requiring a partnership between Health Hero and its clients and perhaps with third parties.

Beyond these specific suggestions, we recommend that Health Hero keep a mindset of continual improvement. The literature on case management points out substantial disagreements about how and how well case management programs work. Thus Health Hero is not simply providing a product or service for which there is generally agreed methodology. Health Hero needs to keep abreast of advances made by others in case management practice and theory, and they should seek to contribute their own advances by monitoring and continually improving the case management programs of which they are a part.

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