

Barriers and facilitators to chemotherapy patients' engagement in medical error prevention

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Background: Medical errors are a serious threat to chemotherapy patients. Patients can make contributions to safety but little is known about the acceptability of error-preventing behaviors and its predictors.

Patients and methods: A cross-sectional survey study among chemotherapy patients treated at the oncology/hematology unit of a regional hospital was conducted. Patients were presented vignettes of errors and unsafe acts and responded to measures of attitudes, behavioral control, norms, barriers, and anticipated reaction.

Results: A total of 479 patients completed the survey (52% response rate). Patients reported a high level of anticipated activity but intentions to engage for safety varied considerably between the hypothetical scenarios (range: 57%–96%, $\chi^2 P < 0.001$). Health, knowledge and staff time pressure were perceived as most important barriers. Instrumental [odds ratio (OR) = 1.3, $P = 0.046$] and experiential attitudes (OR = 1.4, $P < 0.001$), expectations attributed to clinical staff (OR = 1.2, $P = 0.024$) and behavioral control (OR = 1.8, $P < 0.001$) were predictors for patients' behaviors.

Conclusions: Patients are affirmative toward engaging for safety but perceive considerable barriers. Intentions to engage in error prevention vary by clinical context and are strongly influenced by attitudes, normative and control beliefs. To successfully involve patients in medical error, prevention clinicians need to address their patients' beliefs and reduce barriers through education.

Key words: chemotherapy, medical errors, oncology, patient safety, patient participation, survey

introduction

Medical errors pose a serious threat to cancer patients [1]. Walsh et al. observed a medication error rate of 8.2 per 1000 medication orders among adult cancer patients [2]. A large fraction of medication errors occur at the administration stage [3, 4]. Common errors include underdosing and overdosing, confusion of drugs or patients and other incidents. Besides professional activities to prevent errors, e.g. electronic prescribing and standardized order entry, research and clinical experience suggests that patients can be a valuable resource for ensuring safe care [5]. Chemotherapy patients may be particularly qualified to get involved in error prevention as they often experience recurrent procedures and intense episodes of care and thus develop expertise regarding treatment administration [6]. Several hospitals are implementing activities to engage patients as 'vigilant partners.' For example, the "Speak Up" initiative of the Joint Commission recommends: "if you are given an IV, ask the nurse how long it should take for the liquid to run out. Tell the nurse if it doesn't

seem to be dripping right" [7]. The 'You can' campaign at the Dana-Farber Cancer Institute asks patients to 'Check. Ask. Notify' [8]. Despite the prevalence of these programs, little is known about patients' comfort with or perceived barriers to reporting errors.

Studies indicate that many patients have affirmative attitudes toward participating in safety on a general level and expect being informed about error prevention by hospitals [9]. Still, actual engagement in safety-related behavior is substantially less frequent [5]. Patient involvement in safety within the hospital setting is embedded in complex social relations between patients and providers and processes of care. Patients may have only vague ideas about how ensuring safe care translates to concrete situations. In addition, they may experience strong barriers, e.g. severe disability, and these barriers may coexist despite strong general positive attitudes. Finally, patients may support involvement in safety-related behaviors but may personally feel little qualified due to disability or low perceived self-efficacy. The main aim of this study was to explore chemotherapy patients' intentions to engage in medical error prevention. To study which error-preventing behaviors are acceptable to patients, we used brief descriptions of clinical situations and simulated safety-relevant

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contexts in a survey study among cancer patients. The relevance of impeding and facilitating factors for patients' anticipated behaviors in relation to the clinical situations was investigated. We hypothesized that patients' attitudes, subjective norms, perceived behavioral control and several barriers would strongly affect intentions to act and would considerably vary between the hypothetical scenarios.

methods

survey instrument

A cross-sectional survey study among chemotherapy patients was conducted. Based on the literature and prior research, a self-administered survey was developed [5, 6, 10, 11]. The theoretical framework that guided development of measures was the theory of planned behavior (TPB) [12]. In brief, TPB suggests that attitudes, i.e. the degree to which performing a behavior is positively or negatively valued; perceived social norms, i.e. social pressure to show the behavior and behavioral control, i.e. patients' perceptions of their own ability to engage in the behavior, are linked to intentions to perform a specific health-related behavior. Intentions have been shown to be predictive for actual behavior for a number of settings [13, 14].

The survey included brief case notes (vignettes) of potential errors occurring in chemotherapy administration within a larger survey study relating to patients' perceptions of chemotherapy safety. The term 'error' was introduced at the beginning of the survey: 'Errors in care can occur and manifest in multiple ways. For example, a drug can be omitted by mistake or the wrong dose is being administered. Not all errors cause harm though, e.g., because they are identified and intercepted before reaching the patient.'

Vignettes were created based on clinical experience, patients' and staff reports, and discussed with clinicians to represent realistic situations that are reasonable and understandable by patients. Vignettes reported errors, overrides of safety barriers and unsafe acts and included descriptions of confused drugs, forgotten hand disinfection, wrong number of dispensed tablets and others (see Appendix). The nine vignettes were grouped into sets of three. Three survey versions were created to include one set of vignettes each. These versions were randomly allocated to the sample. The vignettes were introduced by the text: 'On the following pages three situations are presented to you that can happen in hospital. Please imagine that you would experience the described situation. We will ask you several questions whether and how you personally would respond to the situation.' Patients were asked a series of questions following *each* vignette.

Patients were asked whether they would act in case they experience the described situation. These specific target behaviors differed between vignettes and represented actions typically recommended to patients such as asking staff to wash their hands or to check infusion bag labels. The target behaviors are presented in the Appendix. Patients were asked whether they would perform the target behavior (coded '1') or not (coded '0').

Difficulty of the hypothetical decision to act was measured on a 7-point Likert scale ranging from 'not at all difficult' (1) to 'very difficult' (7).

Barriers to perform the target behaviors were assessed with seven items, measured on a 7-point Likert scale ranging from 'not at all' (1) to 'strongly' (7). Barrier items were preceded by the question, 'How strongly do the following factors deter you from [target behavior]?' The items were 'Staff time-pressure or stress' (B1); 'My health condition' (B2); 'My knowledge' (B3); 'The reaction I expect from staff' (B4); 'My awareness and memory' (B5); 'My courage' (B6); 'My aims or intentions' (B7). Cronbach's alpha of the scale was 0.88.

Attitudes toward the target behavior were measured with three experiential attitudes items (ATT-E) and 3 instrumental attitude items (ATT-I). Experiential attitudes relate to patients' affective beliefs and valuations of the 'process' of engaging in error prevention, while instrumental attitudes relate to cognitive beliefs regarding the outcomes of the behavior. Attitude items used the stem 'For me, to [target behavior] is ...' and presented 7-point bipolar adjective response scales anchored 'easy (7) / difficult (1)' (ATT-E1); 'familiar (7)/unfamiliar (1)' (ATT-E2); 'pleasant (7)/unpleasant (1)' (ATT-E3); 'good (7)/bad (1)' (ATT-I1); 'useful (7)/worthless (1)' (ATT-I2); 'beneficial (7)/harmful (1)' (ATT-I3). The [target behavior] was replaced by the target behavior presented in the intention simulation initially. Cronbach's alpha of the scales was 0.83 (ATT-E) and 0.77 (ATT-I), respectively.

Perceived behavioral control (PBC) was assessed with two items measured on a 7-point Likert scale ranging from 'completely agree' (7) to 'completely disagree' (1): 'I am confident that I can [target behavior],' (PBC1); 'I am sure, I could [target behavior] if I want to,' (PBC2). Cronbach's alpha of the scale was 0.76.

Subjective norms were assessed with two items measured on a 7-point Likert scale ranging from 'completely agree' (7) to 'completely disagree' (1): 'People who are important to me (e.g. family) expect me to [target behavior],' (NORM1); 'Staff expects me to [target behavior],' (NORM2). Cronbach's alpha of the scale was 0.51.

Experience of error in chemotherapy was assessed by asking patients whether an error occurred in their treatment (yes, possibly yes, possibly no, not at all). Patients were asked to rate their current concern for errors in treatment (very concerned, moderately concerned, not concerned). Effectiveness of patient involvement was assessed by asking whether patients can help to prevent errors in treatment (yes, possibly yes, possibly no, not at all).

The development of the instrument was based on extensive qualitative research using similar scales and was pretested for acceptance and comprehension in 15 patients.

sample

Patients treated at the oncology/hematology department including the ambulatory infusion unit of a large regional hospital in Switzerland were recruited for participation in the study. There were few inclusion criteria, namely age >18 years, treatment with antineoplastic drugs, ability to understand German and no information on death stored. Medical records of patients were screened for these criteria. Identified patients received the survey together with a cover letter asking for informed consent and a prepaid envelope. A reminder and a copy of the survey instrument were sent 4 weeks later. Age, gender, insurance and cancer diagnosis were extracted from medical records.

data analysis

Data were analyzed using descriptive statistics. Cronbach's alpha was calculated to examine consistency of scales. Mean scale scores were calculated for multiple item constructs (e.g. instrumental attitudes) by dividing the sum scores by the number of items adjusted for missing values. χ^2 tests, *t*-tests and one-way analysis of variance were used for group comparisons involving categorical and interval data, respectively. Tests were two-sided and a $P < 0.05$ was considered significant. Multiple logistic regression analysis was used to determine predictors for patients' responses to the vignettes (target behavior no versus yes). The type of vignette (dummy coded), the scale scores of the barriers, attitudes and behavioral control scale scores, decision difficulty and personal characteristics were used as independent variables. Due to limited consistency of the norms scale, the two items measuring norms were entered instead of the scale score. As each patient responded to three vignettes, robust estimators of

variance were specified to allow for clustering, i.e. to relax the assumption of independence of the observations. The research protocol was approved by the local Ethics Committee (ref. 2008/035).

results

A total of 923 patients were included in the study and 479 returned the completed survey (52% response rate). Table 1 reports responders' characteristics. There were no significant differences between responders and nonresponders in terms of mean age (61.2 versus 60.9, $P = 0.7920$) and gender (50.1% versus 45.3% women, $P = 0.142$). However, compared with nonresponders, responders were more likely to have private insurance (7.9% versus 4.1%, $P = 0.014$). Breast cancer (23.0% versus 16.4%, $P = 0.01$) and hematological cancers (27.8% versus 17.1%, $P < 0.001$) were more frequent, while lung cancer (8.4% versus 16.7%, $P < 0.001$) was less frequent among

responders. About 11.5% of participants reported to have experienced errors in their care and 10.6% were very concerned about the safety of their care; 77.3% of patients agreed that patients can help to prevent errors (46.8% 'yes' and 30.5% 'possibly yes').

As Figure 1 shows, there were important differences in patients' simulated intentions to act between the scenarios (Figure 1; χ^2 for differences between vignettes $P < 0.001$). While 96% would ask a nurse to recheck the infusion if they experienced symptoms (vignette 4), only 57% would remind a nurse to disinfect her hands (vignette 2). Calculated over all nine vignettes, 84% of responses indicated that patients would perform the target behaviors. The mean decision difficulty score was comparatively low (mean = 2.33, standard deviation = 1.76) and differed significantly between vignettes (Figure 1; $F = 7.16$, $P < 0.001$).

Responders' perceived a number of barriers to perform the behaviors (Table 2). The mean score on the barrier items were highest for vignettes 7 (infusion bag labels), 2 (handwashing) and 3 (double-check). Across vignettes, patients' health condition (B2), staff time pressure or stress (B1) and knowledge (B3) were perceived as most relevant barriers.

Figure 2 presents mean scale scores of the attitude, norms and perceived behavioral control items by vignette. One-way analyses of variance revealed that the differences in these scale scores between the vignettes were all significant (experiential attitudes: $F = 5.85$, $P < 0.001$; instrumental attitudes: $F = 3.61$, $P < 0.001$; PBC: $F = 6.06$, $P < 0.001$; subjective norms: $F = 10.44$, $P < 0.001$). In other words, patients sensitively adjusted their responses to the situations and behaviors described to them. Averaged over all vignettes ('mean' in the Figure 2), instrumental attitude scores, i.e. cognitive beliefs, were significantly higher than experiential attitude scores, i.e. affective beliefs (5.4 versus 3.8, $P < 0.001$). Experiential and instrumental attitudes were only moderately correlated (Pearson correlation coefficient = 0.50). Subjective norms related to significant others were significantly higher as

Table 1. Sample characteristics ($n = 479$)

Characteristic	% Patients
Age, years ^a [mean, (SD)]	61 (14)
18–25	1.9
26–40	5.9
41–55	22.8
56–70	42.8
71–80	21.3
>81	5.4
Female gender ^a	50.1
Public insurance ^a	92.1
Education	
Primary education	17.9
Secondary education	67.1
Tertiary education	14.9
Primary cancer ^a	
Breast	23.0
Lung	8.4
Hematological	27.8
Gastrointestinal	17.1
Genitourinary	11.7
Oropharyngeal	4.2
Gynecologic	2.3
Other	4.0
Unreported	1.7
Self-rated general health	
Very good	18.0
Good	51.5
Moderate	24.8
Poor	4.0
Very poor	1.8
Experienced cancer treatment ^b	
Surgery	55.8
Infusion/s.c. injection	85.0
Oral medication	61.0
Blood transfusion	26.1
Other	15.2

^aAbstracted from medical records.

^bMultiple responses allowed.

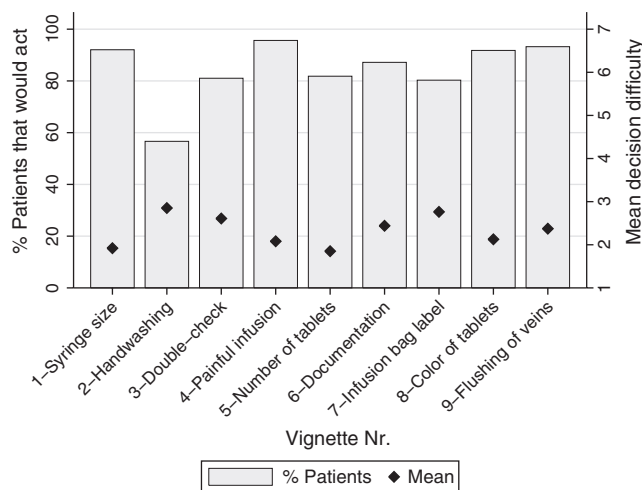


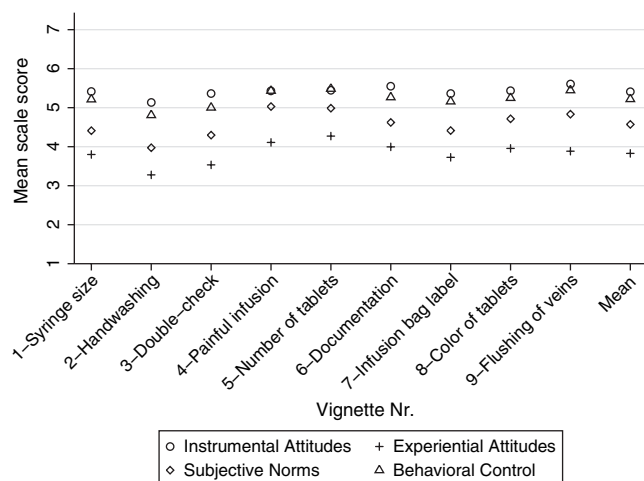
Figure 1. Fraction of patients that anticipated target behavior and mean decision difficulty, by vignette.

Table 2. Relevance of barriers by vignettes. Numbers are mean scores (SD) on the 7-point Likert scale assessed for each barrier ($n = 479$ patients; each patient provided seven ratings of barriers for three vignettes)

	Survey version A			Survey version B			Survey version C			Mean over vig.
	Vig.1	Vig.2	Vig.3	Vig.4	Vig.5	Vig.6	Vig.7	Vig.8	Vig.9	
B1: staff time pressure or stress	3.02 (2.08)	3.53 (2.22)	3.66 (2.3)	2.79 (2.08)	2.52 (2.08)	3.27 (2.23)	3.59 (2.21)	3.05 (2.14)	3.33 (2.22)	3.19 (2.2)
B2: health condition	3.25 (2.16)	3.35 (2.23)	3.44 (2.26)	3.22 (2.28)	2.81 (2.25)	3.08 (2.34)	3.70 (2.28)	3.35 (2.29)	3.52 (2.37)	3.29 (2.28)
B3: knowledge	3.17 (1.97)	3.27 (2.15)	3.11 (2.05)	3.17 (2.13)	2.77 (2.12)	2.92 (2.10)	3.66 (2.28)	3.03 (2.23)	3.06 (2.21)	3.13 (2.14)
B4: expected reaction of staff	2.72 (1.98)	2.7 (1.98)	2.8 (2.03)	2.64 (2.04)	1.94 (1.57)	2.53 (2.04)	3.17 (2.12)	2.48 (1.80)	2.71 (1.96)	2.63 (1.97)
B5: awareness and memory	3.28 (2.00)	3.28 (2.03)	3.22 (1.96)	2.78 (2.05)	2.54 (1.99)	2.72 (2.02)	3.46 (2.27)	2.78 (2.05)	3.11 (2.14)	3.03 (2.07)
B6: courage	2.67 (1.95)	2.90 (2.01)	2.89 (2.00)	2.49 (1.90)	1.98 (1.58)	2.42 (1.92)	2.95 (2.13)	2.54 (1.78)	2.58 (2.02)	2.61 (1.94)
B7: aims or intentions	2.63 (2.00)	2.63 (2.07)	2.79 (2.13)	2.37 (2.00)	2.27 (2.05)	2.51 (2.13)	2.97 (2.17)	2.61 (2.10)	2.74 (2.19)	2.61 (2.09)
Mean over barriers ^a	3.00 (1.54)	3.18 (1.65)	3.18 (1.71)	2.81 (1.55)	2.49 (1.60)	2.80 (1.65)	3.41 (1.69)	2.88 (1.69)	3.04 (1.73)	

^aMean scale score of the barrier measure significantly different between vignettes ($F = 4.09, P < 0.001$).

Vig.1, syringe size; Vig.2, handwashing; Vig.3, double-check; Vig.4, painful infusion; Vig.5, number of tablets; Vig.6, documentation; Vig.7, infusion bag labels; Vig.8, color of tablets; Vig.9, flushing of veins; see 'Methods' section and Appendix for detailed descriptions of items.

**Figure 2.** Mean scale scores for measures of instrumental and experiential attitudes, perceived behavioral control and subjective norms, by vignette.

compared with norms related to hospital staff (5.00 versus 4.22, $P < 0.001$) and only weakly correlated (Pearson correlation coefficient = 0.35). That is, responders expected that staff would approve their engagement for safety less compared with their beliefs regarding significant others. The weak correlation supports the differentiation between norms attributed to the hospital and the private environment.

Table 3 reports the results of the regression analysis. This analysis confirms the strong variation in acceptability of the nine vignette and behavior combinations. Patients' intentions to engage for their safety was strongly influenced by the type of situations described to them. Relative to vignette 1 (syringe size), patients were less prepared 'to remind staff to wash their hands' (vignette 2), 'to ask for double-checking an infusion' (vignette 3), 'to report a missing tablet' (vignette 5), 'to ask for a check of infusion bag labels against the treatment plan' (vignette 7) and 'to request to get the personal file' (vignette 6).

Higher degrees of perceived behavioral control and positive attitudes significantly increased the likelihood that patients would engage for safety, irrespective of the particular situation described in the vignettes: for each point increase on the PBC scale score, the odds that patients would perform the safety behaviors nearly doubled. Stronger beliefs that staff, but not important others, would expect and approve the target behavior also affected responders' intentions. Contrary, strength of barriers and having experienced an error decreased patients' intentions. Being concerned about safety also contributed to anticipated action-taking. Among demographic variables, only education was associated with intentions to perform the target behavior.

The joint effect of attitudes, norms relating to staff and behavioral control on the likelihood of anticipated target behavior was simulated for two hypothetical populations: patients with rather negative attitudes, low levels of perceived norms and low perceived control (a hypothetical scale score = 2 for these four constructs), and those with positive attitudes, high levels of perceived norms and high behavioral control (a scale score = 6 for the constructs). Figure 3 illustrates the predicted probabilities that these patients would report the target behavior for each vignette, keeping all other variables constant at their mean. The impact of the situations and target behaviors is marginal for subjects with high scores, but considerable for patients with low scores on the constructs. Just in vignette 4, the only one that signals 'actual harm' (painful infusion) does the probability to respond to the situation with the target behavior approach 0.5 in these patients, i.e. a positive outcome.

discussion

In this study, we used distinct clinical situations and safety-related behaviors to investigate chemotherapy patients' intentions to engage in error prevention. Overall, patients reported a high level of anticipated activity but the

Table 3. Results of logistic regression analysis to predict hypothetical target behavior (responses to vignettes)

	Odds ratio	95% CI	P
Type of vignette and behavior, to base vignette 1 (syringe size)			
Vignette 2 (handwashing)	0.098***	0.046–0.213	0.000
Vignette 3 (double-check)	0.381**	0.184–0.786	0.009
Vignette 4 (painful infusion)	1.292	0.453–3.683	0.632
Vignette 5 (number of tablets)	0.179***	0.071–0.451	0.000
Vignette 6 (documentation)	0.395*	0.163–0.958	0.040
Vignette 7 (infusion bag labels)	0.261**	0.111–0.616	0.002
Vignette 8 (color of tablets)	0.814	0.303–2.185	0.683
Vignette 9 (flushing of veins)	0.788	0.302–2.055	0.626
Decision difficulty	0.965	0.847–1.100	0.594
Perceived behavioral control, scale score	1.790***	1.451–2.208	0.000
Experiential attitudes, scale score (ATT-E)	1.398***	1.158–1.686	0.000
Instrumental attitudes, scale score (ATT-I)	1.324*	1.005–1.744	0.046
Subjective norms relating to important others (NORM1)	1.004	0.865–1.167	0.954
Subjective norms relating to staff (NORM2)	1.167*	1.020–1.334	0.024
Perceived barriers, scale score	0.829*	0.713–0.965	0.015
Error experience	0.481*	0.247–0.936	0.031
Being very concerned for errors	2.381*	1.060–5.348	0.036
Affirmative attitude toward patient preventability of errors	0.924	0.562–1.517	0.754
Age, years	1.003	0.986–1.020	0.766
Female gender	1.037	0.681–1.578	0.866
Primary education	1.993*	1.045–3.799	0.036
Self-rated general health	0.935	0.736–1.186	0.578

n = 1212 responses, 479 patients; missing data deleted casewise.
 Wald $\chi^2(22)$: 233.49, *P* < 0.0001; McFadden's *R*²: 0.36; McKelvey and Zavoina's *R*²: 0.51.
 P* < 0.05, *P* < 0.01, ****P* < 0.001.
 CI, confidence interval.

acceptability of the target behaviors varied considerably between vignettes. As others, we found that reminding staff to disinfect hands is highly demanding for patients [9, 15]. Health, knowledge and staff time pressure are the most important barriers for patients. Our results also show that instrumental and experiential attitudes toward specific behaviors, expectations attributed to clinical staff and in particular perceived behavioral control are the key forces in predicting patients' hypothetical behaviors. This highlights the central importance of beliefs about ability to control own

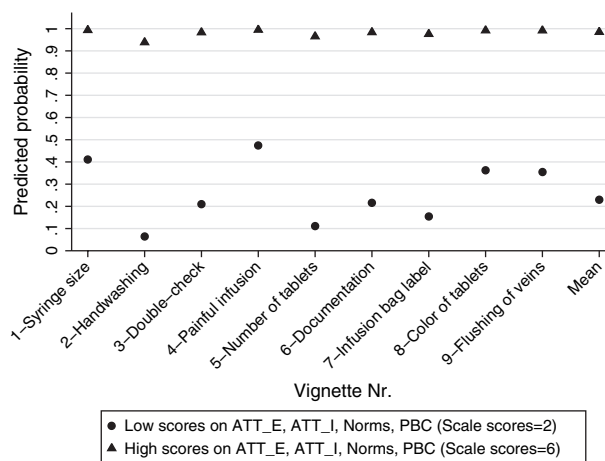


Figure 3. Predicted probability to respond to the situation with the target behavior for two hypothetical patient populations, by vignette (based on multiple regression analysis).

behavior in understanding patients' engagement in safety [16, 17]. In a recent study, perceived behavioral control was not only predictive for intentions to ask staff about handwashing but also for actual behaviors. Our study adds to the existing evidence in that we differentiated between instrumental and experiential attitudes, and between subjective norms relating to staff and important others. The high level of instrumental attitudes compared with significantly lower experiential attitudes indicate that patients identify the potential positive impact of their activities on safety but feel less comfortable with the process of performing the behaviors. While expectations attributed to clinical staff significantly affected intentions to engage in safety-related behaviors, norms relating to significant others, e.g. relatives did not. In other words, patients are more likely to engage for their safety if they feel that staff expects them to. Previous research revealed that many patients have a high motivation to comply with staff expectations and instructions for safety seem to play a crucial role [10, 15].

Our study has some limitations that need to be addressed. First, we sampled only patients from one hospital and the generalizability of our results is thus unclear. Second, the response rate is not satisfactory. While distributions of age and gender did not differ between responders and nonresponders, the overrepresentation of some types of cancer may bias the results. Third, we surveyed patients about hypothetical situations and simulated intentions. The relative high level of anticipated action-taking may indicate overestimation of patients' own behaviors, e.g. due to social desirability. Intentions have been shown to be predictive of actual behaviors for a variety of health-promoting behaviors, e.g. physical activity and exercise, safer sex, adherence to diet, and self-examination behavior [18–21]. However, research also suggests that the impact of intentions on behavior is smaller when there is potential for social reaction [22]. Future research is needed regarding the predictive power of intentions for behavior in socially complex environments such as patients' error prevention behaviors.

Finally, we used vignettes to describe distinct and realistic situations of errors and unsafe acts, and to operationalize error prevention strategies. This has the advantage that patients rated realistic situations. Indeed, differences between vignettes in terms of attitudes, norms, perceived behavioral control and relevance of barriers confirm that patients sensitively adjusted their responses to the presented clinical situations. However, this approach limits transferability to other contexts.

Despite these limitations, our findings highlight areas for improvement in oncology practice. Staff need to be aware of the impact subjective norms attributed to them has on patients' behavior. Thus, clear and supportive communication of expectations and appropriate response to patients' participation is of high importance. The process of engaging in safety must be made more comfortable for patients. For example, some initiatives implemented patient materials that can be used to remind staff without "speaking up" vocally [23]. Future research is clearly needed into interventions to reduce barriers and increase acceptability of communication about safety between patients and providers. Patients' behavioral control and perceived barriers should be explicitly targeted. Reading through examples of intervening patients or watching other patients engaging for safety are perceived as supportive and can help to increase self-efficacy [16, 24, 25]. Activities to strengthen perceived behavioral control, however, need to be sensitively balanced with different capabilities of patients and during the course of treatment. Involvement of patients in safety is not only a challenge for patients, but also for hospital staff. To be successful, clinicians need opportunities to learn the relevance of their communication and behavior and train adequate responses to intervening patients.

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disclosure

All authors declare that they have no conflict of interest.

references

- Gandhi TK, Bartel SB, Shulman LN et al. Medication safety in the ambulatory chemotherapy setting. *Cancer* 2005; 104: 2477–2483.
- Walsh KE, Dodd KS, Seetharaman K et al. Medication errors among adults and children with cancer in the outpatient setting. *J Clin Oncol* 2009; 27: 891–896.
- Rinke ML, Shore AD, Morlock L et al. Characteristics of pediatric chemotherapy medication errors in a national error reporting database. *Cancer* 2007; 110: 186–195.
- Ford CD, Killebrew J, Fugitt P et al. Study of medication errors on a community hospital oncology ward. *J Oncol Pract* 2006; 2: 149–154.
- Schwappach DL. Review: engaging patients as vigilant partners in safety: a systematic review. *Med Care Res Rev* 2010; 67: 119–148.
- Schwappach DL, Wernli M. Medication errors in chemotherapy: incidence, types and involvement of patients in prevention. A review of the literature. *Eur J Cancer Care* 2010; 19: 285–292.
- Joint Commission on Accreditation of Healthcare Organizations. Speak up initiatives; 2010. <http://www.jointcommission.org/PatientSafety/SpeakUp/>. (28 June 2010, date last accessed).
- Weingart SN, Simchowitz B, Kahlert Eng T et al. The You CAN campaign: teamwork training for patients and families in ambulatory oncology. *Jt Comm J Quality Safety* 2009; 35: 63–71.
- Waterman AD, Gallagher TH, Garbutt J et al. Brief report: hospitalized patients' attitudes about and participation in error prevention. *J Gen Intern Med* 2006; 21: 367–370.
- Schwappach DLB, Wernli M. Am I (un)safe here? Chemotherapy patients' perspectives towards engaging in their safety (online first). *Qual Saf Health Care* 2010 Apr 27 [Epub ahead of print] doi:10.1136/qshc.2009.033118.
- Schwappach DL, Hochreutener MA, Wernli M. Oncology nurses' perceptions about involving patients in the prevention of chemotherapy administration errors. *Oncol Nurs Forum* 2010; 37: E84–E91.
- Fishbein M, Ajzen I. *Belief, Attitude, Intention, and Behavior: An Introduction to Theory and Research*. Reading, MA: Addison-Wesley 1975.
- Godin G, Kok G. The theory of planned behavior: a review of its applications to health-related behaviors. *Am J Health Prom* 1996; 11: 87–98.
- Armitage CJ, Conner M. Efficacy of the theory of planned behaviour: a meta-analytic review. *Br J Soc Psychol* 2001; 40: 471–499.
- Davis RE, Koutantji M, Vincent CA. How willing are patients to question healthcare staff on issues related to the quality and safety of their healthcare? An exploratory study. *Qual Saf Health Care* 2008; 17: 90–96.
- Hibbard JH, Peters E, Slovic P et al. Can patients be part of the solution? Views on their role in preventing medical errors. *Med Care Res Rev* 2005; 62: 601–616.
- Luszczynska A, Gunson KS. Predictors of asking medical personnel about handwashing: the moderating role of patients' age and MRSA infection status. *Patient Educ Couns* 2007; 68: 79–85.
- McGilligan C, McClenahan C, Adamson G. Attitudes and intentions to performing testicular self-examination: utilizing an extended theory of planned behavior. *J Adolesc Health* 2009; 44: 404–406.
- Blanchard CM, Fisher J, Sparling PB et al. Understanding adherence to 5 servings of fruits and vegetables per day: a theory of planned behavior perspective. *J Nutr Educ Behav* 2009; 41: 3–10.
- Mausbach BT, Semple SJ, Strathdee SA et al. Predictors of safer sex intentions and protected sex among heterosexual HIV-negative methamphetamine users: an expanded model of the Theory of Planned Behavior. *AIDS Care* 2009; 21: 17–24.
- Ajzen I, Manstead ASR. Changing health-related behaviors: an approach based on the theory of planned behavior. In van den Bos K, Hewstone M, de Wit J et al. (eds). *The Scope of Social Psychology: Theory and Applications*. New York: Psychology Press 2007; 43–63.
- Webb TL, Sheeran P. Does changing behavioral intentions engender behavior change? A meta-analysis of the experimental evidence. *Psychol Bull* 2006; 132: 249–268.
- McGuckin M, Waterman R, Porten L et al. Patient education model for increasing handwashing compliance. *Am J Infect Control* 1999; 27: 309–314.
- Duncanson V, Pearson LS. A study of the factors affecting the likelihood of patients participating in a campaign to improve staff hand hygiene. *Br J Infect Control* 2005; 6: 26–30.
- Duncan C. An exploratory study of patient's feelings about asking healthcare professionals to wash their hands. *J Ren Care* 2007; 33: 30–34.

appendix

Nine vignettes presented in the survey, translated from original

Set A	Vignette 1: Syringe size
Please imagine ...	
You have been prescribed an intravenous medication in the hospital.	
The nurse enters your room with your medication. She shows you the pre-prepared syringe and reads the label to you out loud, including your name and your date of birth. While the nurse is administering your medication, you realize that the syringe is a lot bigger than the one you remember from your last therapy course	
Target behavior: to point out the size of the syringe to the nurse	
Set A	Vignette 2: Handwashing
Please imagine ...	
You have been admitted to the hospital for your chemotherapy treatment.	
You are waiting for the administration of your intravenous drip. The nurse is disinfecting her hands and is preparing your medication. Shortly before attaching the drip to your IV access, another nurse calls for her support. The nurse leaves your room and returns a little while later to start your therapy. She apologizes for the delay and intends to start your IV drip immediately	
Target behavior: to ask the nurse to re-disinfect her hands	
Set A	Vignette 3: Double-check
Please imagine ...	
You have been admitted to the hospital for your chemotherapy treatment, an IV drip. You realize immediately that it's a busy day at the hospital and that the staff is stressed out and pressed for time. The nurse responsible for attaching the IV drip to your IV line is in a rush. While the medication is infusing, you realize that the nurse has omitted double-checking the infusion with you for appropriateness.	
Target behavior: To ask the nurse to make up for the omission	
Set B	Vignette 4: Painful infusion
Please imagine ...	
You have been admitted to the hospital for your chemotherapy treatment, an IV drip. Some minutes after the start of the drip, your arm begins hurting with a burning sensation. You send for the nurse. The nurse assesses the IV drip and your arm, but she is unable to determine any problem and leaves your room again	
Target behavior: To ask the nurse to stop the drip and recheck your infusion and the IV access	
Set B	Vignette 5: Number of tablets
Please imagine ...	
During a visit with your physician at the hospital, it becomes apparent that you need to take an oral medication at home in order to treat your illness appropriately. The nurse is providing you with a box of tablets. You are instructed to take one tablet twice daily during one week. On the last day of the first week, you notice that there is only one tablet left in your pillbox instead of two for the last day of your treatment. Your next doctor's appointment will not take place until 7 days from now	

appendix. (Continued)

Target behavior: To contact the hospital directly and alert the nurse that one tablet is missing	
Set B	Vignette 6: Documentation
Please imagine ...	
You have been admitted to the hospital for your chemotherapy treatment, an IV drip. You realize immediately that it's a busy day at the hospital and that the staff is stressed out and pressed for time. The doctor informs you that he plans to change your chemotherapy regimen today. You will get an additional medication and the dose of your previously prescribed chemotherapy will be dose reduced. You have to wait for a long time until your infusion is ready for administration. The nurse who is taking care of the IV drip is in a rush. Deviating from the other times she took care of you, she is not carrying your individual chemotherapy documentation. She states "The situation on the unit is chaotic today. It would take too long to wait for the physician's instructions in your personal file".	
Target behavior: To ask the nurse to get your personal file and to double-check your medication	
Set C	Vignette 7: Infusion bag labels
Please imagine ...	
You have been admitted to the hospital for your chemotherapy treatment, an IV drip. The nurse enters your room, carrying your infusion. She shows you the medication and asks you to double check with her the specifications on the infusion bag. There are no pre-printed labels on the infusion bag, only hand-written information. You can identify your name, but your date of birth is missing. The nurse explains that there has been a problem with the computer earlier in the day.	
Target behavior: To ask the nurse to check the infusion bag against the original treatment plan.	
Set C	Vignette 8: Color of tablets
Please imagine ...	
Your cancer is being treated with an oral chemotherapy regimen for several weeks. After a consultation with your doctor, a nurse provides you with an additional box of medication for your treatment. You notice that the pills are white; contrary to the blue tablets you took before. You ask the nurse about the color of the drug. But the nurse states that the tablets have always been white	
Target behavior: To ask the nurse to double-check the accuracy of your drug treatment	
Set C	Vignette 9: Flushing of vein
Please imagine ...	
You have been admitted to the hospital for your chemotherapy treatment, an IV drip. You realize immediately that it's a busy day at the hospital and that the staff is stressed out and pressed for time. The nurse responsible for attaching the IV drip to your IV line is in a rush. While the medication is infusing, you notice that the nurse forgot to flush your vein with saline solution before administering the chemotherapy agent	
Target behavior: To alert the nurse to the fact that the vein has not been flushed with saline solution	