

Chemotherapy Patients' Perceptions of Drug Administration Safety

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A B S T R A C T

Purpose

To explore chemotherapy patients' experiences of drug administration safety and to investigate the relationship between perceptions of risk and harm from error, staff safety practices, and patients' engagement in error prevention strategies.

Patients and Methods

Four hundred seventy-nine chemotherapy patients treated at the oncology/hematology department of a large regional hospital in Switzerland completed a self-administered survey (53% response rate).

Results

Sixteen percent of patients reported having experienced an error in their care, and 11% were currently very concerned about errors. Patients perceived the risk of four detailed errors as rather low, whereas the mean rating of potential harm from error was substantial. Relative to other errors, patients seem to underestimate the harm associated with drug overdosing. Seventy-seven percent of responders agreed that patients can help to prevent errors. Although patients perceived staff as being committed to providing safe care, ratings related to patient involvement in safety were considerably lower. More than one quarter of patients disagreed that staff instructed them to watch for and report errors. Patients engaged in safety behaviors, particularly in those behaviors that are compatible with traditional patient-provider relations. Risk of error perceptions, affirmative attitudes toward patient preventability, and error experience were positively linked to safety-related behaviors, whereas higher levels of global trust in staff safety practices were inconsistently associated with lower frequency of engagement in safety strategies.

Conclusion

Chemotherapy safety is a considerable concern for patients. Many patients are prepared to be involved in error prevention. The results highlight areas for improvement in communication and cooperation for safety between patients and providers.

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INTRODUCTION

Medication errors pose a serious health threat to patients with cancer.^{1,2} Walsh et al³ observed a medication error rate of 8.2 per 1,000 medication orders among adult cancer patients. Common errors include over- and underdosing, scheduling errors, confusion of drugs or patients, and infusion-rate errors. A considerable fraction of medication errors in chemotherapy occur at the administration stage, many of which are, at least theoretically, observable by patients.³⁻⁶ Research suggests that patients with cancer often work hard to ensure safe care and to prevent errors that could cause harm (eg, by reporting deviations from routines to their care providers).⁷⁻¹⁰ Several cancer centers now try to engage patients with cancer as vigilant partners.^{1,8,10-12} Studies conducted in general pa-

tient populations show that patients expect to be informed about safety issues and are willing to engage in their safety, at least theoretically.¹³ Our own qualitative research suggests that chemotherapy patients are aware of the occurrence of medical errors and are prepared to take an active role in error prevention.¹⁴ However, we also found indications that patients may underestimate the risk of medical error. Yet, there is little evidence on chemotherapy patients' perspectives on safety and safety practices. Therefore, the main aim of this study was to explore chemotherapy patients' experiences regarding drug administration safety and to investigate the relationship between perceptions of risk, potential harm, patients' attitudes toward involvement in error prevention, their error prevention strategies, and safety practices. We hypothesized that patients' perceptions

of risk and staff safety practices would be related to their own safety-related behaviors.

PATIENTS AND METHODS

A cross-sectional survey study among chemotherapy patients was conducted in September 2009.

Survey Instrument

On the basis of prior research, a self-administered survey was developed that included the following measures.^{1,14,15} Experience of error in chemotherapy was assessed by asking patients whether an error occurred in their treatment (yes, possibly yes, possibly no, or not at all). Open questions invited patients to describe errors. Patients were asked to rate their current concern for errors in their treatment (very concerned, moderately concerned, or not concerned). Perceptions of risk of error were assessed using four items. For each of the following four errors, patients were asked to rate the risk (ie, the likelihood) that the error occurs during chemotherapy treatment on a 7-point Likert scale ranging from very low to very high: a patient receives the wrong drug; a patient receives an overdose of the correct drug; a patient suffers an infection due to insufficient hygiene; and a patient experiences complications due to wrong administration of an infusion (Cronbach's $\alpha = .82$). Perceptions of risk of harm from error were assessed using four analog items. For each of the detailed errors, patients were requested to indicate the degree of health-related harm after these errors on a 7-point Likert scale ranging from extremely harmful (severe disability or death) to not harmful at all (no health consequences) (Cronbach's $\alpha = .92$). These corresponding risk and harm scales were used to estimate a risk-harm index (see Data Analysis).

Perceptions of safety practices in chemotherapy administration were assessed using eight items. For each of the following statements, patients were asked to indicate their agreement on a 7-point Likert scale ranging from completely agree to do not agree at all: "Staff (doctors and nurses)...": "do everything to prevent errors"; "tell me openly, if something went wrong"; "informed me how to watch for errors"; "work very exact and careful"; "always disinfected their hands before administering an infusion"; "showed me the labels of my infusion bags before administration"; "explained the chemotherapy scheme to me"; and "instructed me to report potential errors" (Cronbach's $\alpha = .81$). Effectiveness of patient involvement was assessed by asking whether patients can help to prevent errors in treatment (yes, possibly yes, possibly no, or not at all). Patient preventability was assessed using seven items rated on a 7-point Likert scale ranging from very likely to very unlikely. Patients were asked to rate the likelihood that a patient who has undergone chemotherapy drug administration several times would detect the following errors: "A nurse forgets to disinfect her hands before administering an infusion"; "Two correct labeled infusion bags are confused between two patients just before administration"; "Fluid does not drip properly because the infusion tube is disconnected"; "The infusion rate has been set too high by mistake"; "A patient is provided oral chemotherapy tablets of a too high-dose"; "The antecedent flushing of the infusion tube with saline solution has been forgotten"; and "At a repeat prescription, wrong anticancer tablets are dispensed to a patient" (Cronbach's $\alpha = .87$).

For the assessment of past safety-related behaviors, responders were asked to report how frequently they performed each of 11 specific behaviors during the course of their treatment measured on a 7-point Likert scale ranging from never to very frequently. These behaviors were (a) "to watch for errors"; (b) "to ask a nurse to disinfect her hands"; (c) "to ask a nurse the name or dose of a drug"; (d) "to ask a nurse to check if a drug or infusion is correct"; (e) "to report symptoms after treatment (eg, infusion) to a nurse"; (f) "to ask a nurse to show or read out loud the labels of a medication"; (g) "to ask a nurse to show or explain the chemotherapy scheme"; (h) "to ask a nurse questions relating to treatment or medications"; (i) "to report side-effects or adverse events of treatment to a nurse"; (j) "to notify a nurse of a potential error"; and (k) "to notify a nurse of intended changes in the treatment plan that were made during the medical consultation (eg, future omission of a drug)" (Cronbach's $\alpha = .85$). For data analysis, these 11 items were further classified as role-

conforming behaviors that are compliant with the traditional patient role and usually well accepted by patients (items c, e, h, and i); proactive behaviors that require safety-related interaction with staff in anticipation of potential errors (items a, f, g, and k); and challenging behaviors that require questioning of medical authority (items b, d, and j). The survey also included demographic and health-related questions. 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, eg, because they are identified and intercepted before reaching the patient." The development of the instrument was based on extensive qualitative research using similar constructs, and the instrument was pretested for acceptability and comprehension in 15 patients.

Table 1. Demographics and Clinical Characteristics of Responders and Nonresponders

Demographic or Clinical Characteristic	% of Patients	
	Responders (n = 479)	Nonresponders (n = 444)
Age, years*†		
Mean	61	61
Standard deviation	14	15
18-25	1.9	3.2
26-40	5.9	5.9
41-55	22.8	22.7
56-70	42.8	36.5
71-80	21.3	25.2
> 81	5.4	6.5
Female sex*†	50.1	45.3
Public insurance*‡	92.1	95.9
Education		NA
Primary education	17.9	
Secondary education	67.1	
Tertiary education	14.9	
Primary cancer*§		
Breast	23.0	16.4
Lung	8.4	16.7
Hematologic	27.8	17.1
GI	17.1	17.3
Genitourinary	11.7	17.6
Oropharyngeal	4.2	6.3
Gynecologic	2.3	2.5
Other	4.0	3.4
Unreported	1.7	2.7
Self-rated general health		NA
Very good	18.0	
Good	51.5	
Moderate	24.8	
Poor	4.0	
Very poor	1.8	
Experienced cancer treatment		NA
Surgery	55.8	
Infusion/subcutaneous injection	85.0	
Oral medication	61.0	
Blood transfusion	26.1	
Other	15.2	

Abbreviation: NA, data not available.

*Abstracted from medical records.

†Not significant different between responders and nonresponders.

‡Significant different between responders and nonresponders ($P = .014$).

§Significant different between responders and nonresponders ($P < .001$).

||Multiple responses allowed.

Table 2. Patients' Perceptions of Risk and Harm From Error in Chemotherapy

Item	Risk of Error				Harm From Error				Risk-Harm Index*	
	Mean Score	SD	% Lowest Rating	% Highest Rating	Mean Score	SD	% Lowest Rating	% Highest Rating	Mean	SD
Wrong drug	2.2	1.3	33.9	1.3	5.8	1.6	2.6	48.5	12.2	6.9
Overdose of correct drug	2.5	1.3	23.3	1.1	5.3	1.8	5.8	32.4	12.7	7.4
Infection as a result of insufficient hygiene	2.4	1.6	35.6	4.1	5.7	1.6	3.3	45.5	13.6	9.3
Complications from wrong infusion administration	2.6	1.5	23.7	3.0	5.8	1.7	5.7	46.2	14.6	9.7
Scale score	2.4	1.2			5.6	1.5			13.2	6.8

NOTE. See Patients and Methods for detailed item and scale descriptions
Abbreviation: SD, standard deviation.

*The risk-harm index is the product of risk and harm ratings per item calculated for each respondent (see Patients and Methods).

Sample

Patients treated at the oncology/hematology department including the ambulatory infusion unit of a large regional hospital in Switzerland were recruited for participation. There were few inclusion criteria, but these were age greater than 18 years, treatment with antineoplastic drugs, and no information on death stored. Medical records of patients were screened for these criteria. Identified patients received the survey with a cover letter and a prepaid envelope. A reminder and copy of the survey were sent 4 weeks later. Age, sex, and cancer diagnosis were abstracted from medical records.

Data Analysis

Data were analyzed using descriptive statistics. Cronbach's α was calculated to examine consistency of scales. Mean scale scores were calculated for multiple item constructs by dividing the sum scores by the number of items adjusted for missing values. For the corresponding risk and harm assessment items, a combined risk-harm index was estimated by multiplying the four perceived risk and harm ratings by item per individual. χ^2 tests, *t* tests, and one-way analysis of variance were used for group comparisons involving categorical and interval data. Logistic regression analysis was used to model error experience as predictor for safety concerns, adjusted for patient characteristics. Multiple regression analysis was used to predict the scale score of the risk-harm index (ie, the mean of the four multiplied risk and harm ratings) from patients' perceptions of staff safety practices. Multiple regression analysis was also used to determine predictors for patients' past safety-related behaviors. Patients' ratings of risk and harm, their error experiences and safety concerns, perceptions of staff safety practices, and attitudes toward involvement were regressed on the scale scores of patients' past safety-related behaviors. Regression models were estimated to predict the scale score of all behaviors (model 1), the scale score of only role-conforming behaviors (model 2), the scale score of only proactive behaviors (model 3), and the scale score of only challenging behaviors (model 4). Tests were two-sided, and a *P* < .05 was considered significant. The research protocol was approved by the local ethics committee (reference No. 2008/035).

RESULTS

Nine hundred twenty-three patients were included in the study, and 479 returned the completed survey (52% response rate). Table 1 lists the characteristics of responders and nonresponders. There were no significant differences between responders and nonresponders in terms of age and sex, but some cancers were over-represented among responders.

Experience of Error and Concerns for Error

Overall, 16.2% of patients reported having experienced error in their treatment (11.5% yes, 4.7% possibly yes, 23.5% possibly no, and

60.3% no); 55.3% of patients were currently somewhat (44.7%) or very (10.6%) concerned about errors in their care. Adjusted for age, sex, and education, patients who reported errors were more likely to be very concerned for future errors (odds ratio = 12.5; 95% CI, 6.2 to 25.1; *P* < .001).

Perceptions of Risk, Harm, and Safety Practices

Patients perceived the risk of the four detailed errors as rather low, whereas their mean rating of potential harm was considerable (Table 2). For example, 35.6% of patients perceived the risk of nosocomial infection in chemotherapy as being very low, whereas 45.5% responded that such an infection would be extremely harmful. Patients' ratings of the corresponding risk and harm items were not correlated (Spearman rank correlation coefficient ranged between -0.21 and -0.02 for the four items and was -0.11 for the scale scores). Patients who had experienced errors gave significantly higher ratings of risk (3.4; 95% CI, 2.9 to 3.8 *v* 2.3; 95% CI, 2.2 to 2.4; *P* < .001) but lower ratings of harm associated with error (4.6; 95% CI, 4.2 to 5.1 *v* 5.7; 95% CI, 5.6 to 5.8; *P* < .001).

There were important differences in patients' perceptions of staff safety practices. Although patients perceived staff as being committed to providing safe and professional care in general, ratings relating to patient involvement in safety practices were considerably lower, in particular relating to error monitoring and reporting (Table 3). The level of agreement was highest for staff-focused safety behaviors (Table 3, items a, d, and e), intermediate for activities to get patients directly involved in chemotherapy safety (items f and g), and lowest for instruction of patients to monitor and report errors (items b, c, and h). More than one quarter of patients disagreed (strongly) that staff informed them how to watch for errors and instructed them to report errors. In multiple regression analysis, significant predictors for the scale score of the risk-harm index were higher levels of agreement with "staff do everything to prevent errors" ($\beta = -1.20, P = .019$), "staff work very exact and careful" ($\beta = -0.95, P = .075$), and "staff always disinfected their hands" ($\beta = -1.22, P = .002$); error experience ($\beta = -2.68, P = .018$) decreased patients' ratings of risk and harm. Being concerned for one's safety ($\beta = 5.52, P < .001$) and educational attainment higher than primary education ($\beta = 2.50, P = .004$) increased the risk-harm index. Perceptions of the remaining staff safety practices (Table 3, items b, c, f, g, and h), age, and sex had no significant effect on risk-harm ratings.

Table 3. Perceptions of Staff Safety Practices in Chemotherapy Administration

Item	Perception of Staff Safety Practices			
	Mean Score	SD	% Disagree (strongly)	% Agree (strongly)
“Staff (doctors and nurses). . .”				
(a) “do everything to prevent errors”	6.5	0.8	0.2	88.3
(b) “tell me openly, if something went wrong”	5.1	1.8	11.7	51.2
(c) “informed me how to watch for errors”	4.3	2.3	28.1	39.6
(d) “work very exact and careful”	6.3	0.9	0.4	82.2
(e) “always disinfected their hands prior to administering an infusion”	6.5	1.0	1.6	88.3
(f) “showed me the labels of my infusion bags prior to administration”	5.7	2.0	11.9	68.6
(g) “explained the chemotherapy scheme to me”	5.4	2.0	12.9	61.7
(h) “instructed me to report potential errors”	4.6	2.3	27.4	48.5
Scale score	5.5	1.2		

NOTE. See Patients and Methods for detailed item and scale descriptions. Abbreviation: SD, standard deviation.

Patient Participation in Error Prevention

A majority of responders agreed that patients can help to prevent errors in chemotherapy (46.8% yes, 30.5% possibly yes, 21.2% possibly no, and 1.5% no). The likelihood that an experienced chemotherapy patient would detect specific errors was rated highest for a “disconnected infusion tube” (mean, 4.6; standard deviation [SD], 2.2) and “forgotten hand hygiene before administration of an infusion” (mean, 4.4; SD, 2.1) and lowest for “confusion of infusion bags” (mean, 3.3; SD, 2.0) and “provision of oral chemotherapy medication of too high-dose” (mean, 3.3; SD, 1.8). The mean scale score over all seven items was 3.7 (SD, 1.5). Patients were also asked to report past safety-related behaviors. There were considerable differences in the frequency of patients’ action taking between specific behaviors. The most frequent behaviors were asking questions related to treatment (mean, 4.4; SD, 1.9) and reporting adverse effects (mean, 4.5; SD, 1.9; Table 4, items h and i). Behaviors reported with least frequency were asking staff to comply with hand hygiene (mean, 1.4; SD, 1.0) and notifying staff of potential errors (mean, 2.1; SD, 1.5; items b and j). Still, between 23.1% and 50.5% of patients reported having performed these challenging behaviors at least once. The mean scale scores for the role-conforming, proactive, and challenging behaviors were significantly different (mean, 4.1 ν 3.0 ν 1.9, respectively; $F = 311.281$; $P < .001$).

Several variables were consistently associated with safety-related behaviors (Table 5). Risk of error perceptions, having experienced errors, affirmative attitudes toward preventability, and higher education increased the frequency of all safety-related behaviors, whereas perceived staff safety practices and age were associated with lower frequency (model 1). This pattern was reproduced for role-conforming behaviors (model 2). The same variables explained engagement in proactive behaviors, except that the harm score additionally decreased the frequency of these behaviors and

Table 4. Patients’ Self-Reported Past Safety-Related Behaviors

Item	Frequency of Past Safety-Related Behaviors			
	Mean Score	SD	% Never	% Very Frequently
Role-conforming behaviors				
(c) “to ask a nurse the name or dose of a drug”	4.0	1.9	15.8	14.1
(e) “to report symptoms after treatment”	3.4	1.9	25.1	7.9
(h) “to ask a nurse questions relating to treatment or medications”	4.4	1.9	11.0	19.0
(i) “to report side-effects or adverse events of treatment”	4.5	1.9	9.9	19.2
Scale score, long-established behaviors (items c, e, h, and i)	4.1	1.5		
Proactive behaviors				
(a) “to watch for errors”	4.2	1.9	14.0	16.2
(f) “to ask a nurse to show or read out loud the labels of a medication”	2.4	1.9	49.6	7.6
(g) “to ask a nurse to show or explain the chemotherapy scheme”	2.5	1.8	44.2	4.7
(k) “to notify a nurse of intended changes in the treatment plan”	2.7	1.8	39.1	4.5
Scale score, active behaviors (items a, f, g, and k)	3.0	1.3		
Challenging behaviors				
(b) “to ask a nurse to disinfect her hands”	1.4	1.0	76.9	1.5
(d) “to ask a nurse to check if a drug or infusion is correct”	2.2	1.7	53.8	4.6
(j) “to notify a nurse of a potential error”	2.1	1.5	49.5	2.1
Scale score, challenging behaviors (items b, d, and j)	1.9	1.1		
Scale score, all items	3.1	1.1		

NOTE. See Patients and Methods for detailed item and scale descriptions. Abbreviation: SD, standard deviation.

perceived safety practices were not significant (model 3). Engagement in challenging behaviors was associated with risk and harm ratings, affirmative attitudes, perceived safety practices, and sex, but not with age, education, and error experience (model 4). A substitution of the scale score of staff practices with the single items of this construct revealed that items measuring general trust in staff commitment for safety, error disclosure, and hand hygiene were responsible for the negative association with patients’ behaviors.

DISCUSSION

A considerable number of patients in our study felt that they have experienced errors in their care, and many were concerned about their safety. A majority of surveyed patients agreed that patients can make contributions to anticancer treatment safety. These results confirm previous studies of patients’ attitudes toward involvement in error prevention strategies.^{14,15}

Some aspects limit the generalizability of our findings. First, we sampled patients from only one hospital, and the results of our study

Table 5. Results of Regression Analyses on Patients' Past Safety-Related Behaviors

Variable	Coefficient	95% CI	P
Model 1: variables regressed on scale score for all behaviors ($r^2 = 0.27$)			
Scale score, risk rating	0.21	0.12 to 0.31	< .001
Scale score, harm rating	-0.03	-0.10 to 0.04	.368
Error experience	0.53	0.21 to 0.85	.001
Being concerned about errors	0.07	-0.26 to 0.41	.663
Affirmative attitude to patient preventability of errors	0.60	0.38 to 0.82	< .001
Scale score, perception of staff safety practices	-0.11	-0.20 to -0.02	.013
Scale score, patient preventability	0.04	-0.02 to 0.11	.213
Age, years	-0.01	-0.02 to -0.003	.003
Female sex	-0.12	-0.30 to 0.07	.206
Above primary education	0.29	0.05 to 0.53	.019
Model 2: variables regressed on scale score for role-conforming behaviors (items c, e, h, and i) ($r^2 = 0.18$)			
Scale score, risk rating	0.12	-0.01 to 0.25	.056
Scale score, harm rating	0.06	-0.03 to 0.15	.232
Error experience	0.69	0.21 to 1.14	.003
Being concerned about errors	0.03	-0.44 to 0.51	.895
Affirmative attitude to patient preventability of errors	0.55	0.24 to 0.85	< .001
Scale score, perception of staff safety practices	-0.19	-0.32 to -0.07	.002
Scale score, patient preventability	0.05	-0.04 to 0.14	.314
Age, years	-0.02	-0.02 to -0.01	.001
Female sex	-0.11	-0.36 to 0.15	.417
Above primary education	0.53	0.19 to 0.87	.002
Model 3: variables regressed on scale score for proactive behaviors (items a, f, g, and k) ($r^2 = 0.29$)			
Scale score, risk rating	0.31	0.19 to 0.41	< .001
Scale score, harm rating	-0.09	-0.16 to -0.01	.027
Error experience	0.65	0.28 to 1.03	.001
Being concerned about errors	0.14	-0.25 to 0.54	.479
Affirmative attitude to patient preventability of errors	0.75	0.49 to 1.01	< .001
Scale score, perception of staff safety practices	0.002	-0.10 to 0.11	.969
Scale score, patient preventability	0.04	-0.04 to 0.11	.306
Age, years	-0.01	-0.02 to -0.01	.010
Female sex	-0.06	-0.28 to 0.15	.554
Above primary education	0.38	0.10 to 0.66	.009
Model 4: variables regressed on scale score for challenging behaviors (items b, d, and j) ($r^2 = 0.23$)			
Scale score, risk rating	0.22	0.13 to 0.31	< .001
Scale score, harm rating	-0.07	-0.14 to -0.01	.016
Error experience	0.16	-0.15 to 0.47	.318
Being concerned about errors	0.02	-0.31 to 0.35	.918
Affirmative attitude to patient preventability of errors	0.47	0.26 to 0.69	< .001
Scale score, perception of staff safety practices	-0.14	-0.23 to -0.06	.001
Scale score, patient preventability	0.04	-0.03 to 0.10	.241
Age, years	-0.003	-0.01 to 0.01	.300
Female sex	-0.21	-0.39 to 0.03	.025
Above primary education	-0.17	-0.41 to 0.06	.145

NOTE. See methods for detailed item and scale descriptions.

thus reflect safety practices at this institution. Second, the response rate is marginally acceptable. Although distributions of age and sex did not differ between responders and nonresponders, the overrepresentation of some cancers may bias the results. Third, we operationalized many measures (eg, risk, harm) using distinct descriptions of particular errors and behaviors. Although this has the advantage that patients rated realistic situations rather than ambiguous constructs, this approach limits transferability. This operationalization of items must be kept in mind when interpreting the results. Despite these caveats, our study has important implications for clinical practice.

Consistent with the literature, patients rated the risk for error as rather low but the potential for harm as substantial. The relative low rating of harm associated with overdosing of a drug compared with other events (eg, nosocomial infection) was unexpected. Several factors may help to explain this finding. First, safety practices to prevent drug overdosing are often less observable by patients compared with procedures to prevent infection (eg, hand hygiene). The frequent observation of disinfection practices is likely to affect patients' judgment that the remaining risk of infection is rather small and that harm associated with infection must be substantial. Thus, observed staff safety practices affect patients' evaluations of risk and harm. Second, research suggests that cancer patients commonly hold misconceptions about anticancer drugs and their effectiveness, such as higher doses must be more effective.¹⁶ Patients assume a dose-response relationship of drugs and thus intuitively neglect the serious risks associated with overdosing. Therefore, patient-provider communication about safety issues in chemotherapy should explicitly address the harms of drug overdosing. This may be even more important with oral outpatient chemotherapy drugs that are administered by patients and are under less control by clinicians.

In line with previous research, our data show that patients report safety behaviors that comply with traditional patient-provider relations more frequently compared with behaviors that require proactive engagement or even demanding interactions that involve questioning medical authority and may be perceived as offensive.^{13,17,18} It must be noted though that the behaviors classified as challenging occur less frequently by definition because the opportunities to show the behaviors are limited. Still, the lower frequency of error monitoring and reporting corresponds with lower levels of agreement with having received the particular instructions by staff. At the same time, many patients reported having been instructed to participate in typical error prevention strategies (eg, controlling infusion bag labels) and also reported this behavior. Thus, it seems likely that clinicians and patients do cooperate for safety, without explicitly naming the aims of these activities as error prevention. This reflects earlier findings that oncology nurses sensitively switch between different education styles to get patients involved but tend to avoid using error-related terms, probably to avoid worry.¹⁹ Future research is clearly needed to illuminate what type of communication with patients is needed to motivate patients to act in case they identify errors.

We also found complex relationships between perceptions of staff safety practices, ratings of risk and harm, and patients' past safety-related behaviors. Experience of error, affirmative attitudes toward patients' potential to prevent errors, and higher error risk

ratings were independently associated with frequent patient safety-related behaviors, in particular proactive behaviors. Importantly, higher ratings of potential harm and more intense levels of global trust in staff safety practices were connected with lower frequency of engagement in some safety strategies. Although the causality of this relationship is unclear, it seems that extremely high and perhaps unrealistic expectations for staff effectiveness in avoiding errors are linked to more passive patient behaviors and are likely to coincide with patients' lower levels of behavioral control and subjective norms. Research suggests that self-efficacy, perceived norms, and worry are important contributors to patients' engagement in their safety.^{15,20,21} Interventions such as patient-oriented teamwork training¹² may help to overcome this ostensible antagonism and educate patients about risks and harm from errors and strengthen patients' self-efficacy without severely affecting trust toward providers.

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AUTHORS' DISCLOSURES OF POTENTIAL CONFLICTS OF INTEREST

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