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The influence of patient safety culture on incident reporting among health care professionals working in public hospitals in Addis Ababa, Central Ethiopia

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Abstract

Background: Patient safety is crucial to the quality of patient care and remains challenging for countries at all levels of development. There is a popular acknowledgement of the importance of establishing patient safety culture in healthcare organizations. Hospitals with a positive patient safety culture are transparent and fair with staff when incidents occur, learn from mistakes, and rather than blaming individuals, look at what went wrong in the system. Health care providers are willing to report the errors but, due to poor reporting system and culture of blame and shame, there exists struggle of disclosure of adverse events.

Objective: To investigate the influence of patient safety culture on incident reporting behavior among health care professionals in public hospitals in Addis Ababa, central Ethiopia.

Methods: Institution based cross-sectional study was conducted from March 15-20, 2017 at public hospitals in Addis Ababa. A total of 697 health professionals were selected by simple random sampling method. Self-administered questionnaire was distributed to collect the data. A multivariate linear regression model was fitted. Then the effect of the socio-demographic variables and patient safety culture dimensions on the dependent variable "incident reporting behavior" was assessed using multiple linear regression analysis.

Results: Among the participants, 20.4% never reported an incident, 13.1% reported rarely, 19.9% reported sometimes. Only 30.4 % reported incidents always. Feedback about error ($\beta=0.136, p=0.008$), management support for safety ($\beta=0.28, p<0.001$), Non-punitive response to error, Supervisor/manager expectation and actions promoting patient safety ($\beta=0.356, p<0.001$) and communication openness ($\beta=0.170, p<0.001$) were the most predictive dimensions of patient safety culture for the incident reporting.

Conclusions: Incident reporting behavior among health care professionals was very low. To increase the incident reporting behavior, placing priority on improving event reporting feedback mechanisms, communication regarding systems and process, giving priority by top-level hospital leadership and non-punitive response to errors.

Keywords: Incident reporting, patient safety culture, Addis Ababa, central Ethiopia

Introduction

Incident reporting is a process defined as the reporting of patient safety concerns by individuals in the health care setting who first discover, witness, or has familiarity with details of an incident, near miss event, or unsafe condition. An event is defined as any type of mistake, error, accident, or deviation, regardless of whether it has caused harm to a patient or not. Incidents that reach the patient resulting in harm according to AHRQ (agency for health research and quality) are considered adverse events. Events not reaching a patient are considered near miss events; unsafe conditions represent situations that increase the likelihood of the occurrence of an incident [1].

Reporting errors is fundamental to error prevention. The focus on medical errors that followed the release of the Institute of Medicine's (IOM) report *To Err Is Human: Building a Safer Health System* centered on the suggestion that preventable adverse events in hospital were a leading cause of death in the United States. Findings from the Harvard Medical Practice Study that found that more than 70 percent of errors resulting in adverse events were considered to be secondary to negligence, and more than 90 percent were judged to be preventable [2]. The IOM report also emphasized the importance of reporting errors, using systems to "hold providers accountable for performance," and "provide information that leads to improved safety." Conceptually these purposes are not incompatible, but in reality

they can prove difficult to satisfy simultaneously^[3]. Many errors go unreported by health care workers. The major concern they have is that self-reporting will result in repercussions. Providers' emotional responses to errors inhibit reporting, yet some are relieved when they share the events of the error with patients. Health care professionals reported feeling worried, guilty, and depressed following serious errors as well as being concerned for patient safety and fearful of disciplinary actions. They also are aware of their direct responsibility for errors^[4, 5, 6]. Self-reporting errors can be thwarted by several factors. First, clinicians fear career- threatening disciplinary actions and possible malpractice litigation and liability^[7, 8]. Health care leaders who do not protect reporters of errors from negative consequences reinforce this fear, as does the criminalization of fatal health care mistakes^[9]. Fear of these negative consequences can lead to reporting errors only when a patient is harmed or when the error could not be "covered up"^[10]. Second, clinicians working in a culture of blame and punishment do not report all errors, primarily because they fear punishment. Many organizations have been challenged to provide an environment in which it is safe to admit errors and understand why the errors occurred^[11]. Fears of reprisal and punishment have led to a norm of silence. But silence kills, and health care professionals need to have conversations about their concerns at work, including errors and dangerous behavior of coworkers. Among health care providers, especially nurses, individual blame has been the predominant reaction for errors^[12].

Patient safety culture: - A safe culture is an environment in which there is shared responsibility, role clarity and open and frequent communication related to safety. Key values and activities are nurtured and rewarded including employee awareness, vigilance, a process for formally identifying hazards and action steps for resolving safety concerns and problems^[13]. Patient safety culture is a component of organizational culture, includes the shared beliefs, attitudes, values, norms and behavioral characteristics of employees and influences staff member attitudes and behaviors in relation to their organization's ongoing patient safety performance^[14].

Patient safety is a critical component of health care quality. As health care organizations continually strive to improve, there is a growing recognition of the importance of establishing a culture of safety. Achieving a culture of safety requires an understanding of the values, beliefs, and norms about what is important in an organization and what attitudes and behaviors related to patient safety are expected and appropriate^[15]. Measuring safety culture or climate is important because the culture of an organization and the attitudes of teams have been found to influence patient safety outcomes and these measures can be used to monitor change over time. It may be easier to measure perception of safety culture than safety culture practice^[16]. An inclusive and systematic approach to incident reporting would help learning from errors and adverse events within the same setup^[17]. Through incident reporting, various kinds of errors can be traced and discussed among health professionals and preventive mechanisms can be designed^[18]. Despite the significant contribution of incident reporting to patient safety, the magnitude of underreporting remains high in different countries across the globe^[19]. For instance, it occurs at a rate of 50%–96% in the United States^[18]. The

World Health Organization (WHO) estimates that tens of millions of patients worldwide endure disabling injuries or death each year that can be attributed directly to unsafe medical practices and care^[20]. The seminal Institute of Medicine (IOM) report *To Err Is Human: Building a Safer Health System* found that medical errors kill between 44,000 and 98,000 people in U.S. hospitals each year. Using the lower estimate, more people die from medical errors in a year than from highway accidents, breast cancer, or AIDS. The IOM committee recommended that healthcare organizations create an environment in which culture of safety is an explicit organizational goal, becomes a top priority, and is driven by leadership. In response to the recommendations of the IOM, healthcare organizations began the process of improving the widespread deficits in patient safety, including a focus on organizational safety culture^[21]. In the UK National Health Service (NHS) it is believed that a serious adverse event or critical incident occurs in up to 10% of all hospital admissions. That amounts to about 850,000 adverse events per year^[22]. The total national cost of preventable adverse medical events in the USA, including lost income, disability and medical expenses, is estimated at between US\$ 1.7 billion and US\$ 2.9 billion annually. Added to these costs is the erosion of trust, confidence, and satisfaction among the public and health care providers^[23]. Studies from a variety of developed countries show that about one in ten patients are harmed while receiving hospital care. The consequences are devastated lives and billions of dollars unnecessarily spent on prolonged hospitalization, loss of income, disability and litigation. In the Eastern Mediterranean and African study, almost one third of patients who suffered a harmful incident died. Another 14% sustained permanent disability, 16% sustained moderate disability, 30% were left with minimal disability and 8% of the patients' harm could not be specified^[24]. In Ethiopia, the Ministry of Health has designed strategies, procedures, and processes for patient care quality which included an incident reporting system. According to the Ethiopian hospital reform implementation guideline, an incident officer should be assigned to each hospital to receive and investigate all incident reports to the quality of the service being offered to users, supporting health facilities to evaluate and improve the provision of effective health services. A summary report of all incidents must be submitted to a quality assurance committee of each hospital^[32]. Although quite a lot of studies are available regarding incident reporting mainly in the western countries, very limited information exists in Ethiopia, particularly in the study area.

Methods

Study area and design

A cross-sectional study was conducted in public hospitals found in Addis Ababa from March 15-20/2017. In Addis Ababa, there are 12 public hospitals These are Amanuel Hospital, Armed force hospital, Alert Hospital, Black Lion hospital, Dejach Balcha hospital, Ghandi hospital, Menilik hospital, Police hospital, RasDesta hospital, St, Pauls hospital, Yekatit 12 hospital, St. Peter hospital. Among these, five hospitals were selected for this study by lottery method. These are St. Paul specialized Hospital, St. Emanuel psychiatric specialized Hospital, St. Peter specialized Hospital, ALART specialized hospital, and Tikur Anbesa specialized teaching Hospital. Concerning the

number of health professionals, St. Paul has a total of 1041 health professionals, Amanuel hospital had 456, Tikur Anbesa hospital had 964, ALART hospital had 560, St. Peter had 456 health professionals.

Source population

All health care professionals in selected public Hospitals

Study population

Sampled health care professionals in the selected public Hospitals

Sampling procedure and data collection

Multi-stage simple random sampling technique was used. The hospitals were selected by lottery method and Proportional allocation of the respondents was done for each hospital based on their number of health care professionals. Respondents were selected by simple random sampling by using the list of the professionals from the human resource management as a sampling frame. As shown in figure 1.

Study variables and Measurement

An incident- An injury, a medical error, and/or a near miss caused by a health care organization or a health professional unintentionally.

Incident reporting behavior

Is defined as reporting patient safety concerns by health care providers in public hospitals in Addis Ababa City Administration who may discover, identify, witness, or have familiarity with the occurrence of an event, unsafe condition, or near miss event that did not reach the patient. It was measured using three items; ^[1] when a mistake is made, but is caught and corrected before affecting the patient, how often is this reported? ^[2] When a mistake is made, but has no potential to harm the patient, how often is this reported? ^[3] When a mistake is made that could harm the patient, but does not, how often is this reported? It was measured by asking respondents to evaluate these issues on 5- point frequency (1 never to 5 always). Incident reporting is operationalized as the participant's score on the frequency of events reported dimension on HSOPSC.

Patient Safety Culture Composite Definitions

Teamwork within hospital units

It measures whether staff support one another, treats each other with respect and work together as a team. It was measured using four items considering four different scenarios (people support one another in this unit, when a lot of work needs to be done quickly, we work together as a team to get the work done, in this unit, people treat each other with respect, and fourth when one area in this unit gets busy, others help). It was measured by asking respondents to evaluate these issues on 5- point Likert scales (1 strongly disagree to 5 strongly agree). It is operationalized as the participants score on teamwork within hospital units dimension on HSOPSC.

Communication openness

This domain assesses whether staff freely speak up if they see something that may negatively affect a patient and feel free to question those with more authority. It was measured using a 5 point Likert scale (1-strongly disagree to 5-strongly agree) of three items. The items are; ^[1] Staff will

freely speak up if they see something that may negatively affect patient care; ^[2] Staffs feel free to question the decisions or actions of those with more authority; ^[3] Staffs are afraid to ask questions when something does not seem right. Communication openness is operationalized as the participants' score on communication openness dimension on HSOPSC.

Feedback and Communication about Error

It refers to whether staffs are informed about errors that happen, are given feedback about changes implemented, and discuss ways to prevent errors. It was measured using three 5 point Likert scale items (1 never to 5 always); ^[1] We are given feedback about changes put into place based on event reports; ^[2] We are informed about errors that happen in this unit; ^[3] In this unit, we discuss ways to prevent errors from happening again. Feedback and communication about error is operationalized as the participant's score on the feedback and communication about error dimension on the HSOPSC.

Hospital Handoffs & Transitions

Assesses whether important patient care information and drug is transferred across hospital units and during shift changes. It was measured using a scale having three items. These are; ^[1] Things "fall between the cracks" when transferring patients from one unit to another; ^[2] Important patient care information is often lost during shift changes; ^[3] Shift changes are problematic for patients in this hospital. Each item has five response categories ranging from strongly disagree ^[1] to strongly agree ^[5]. Hospital handoffs & transitions is operationalized as the participants score on Hospital Handoffs & transitions dimension on HSOPSC.

Hospital Management Support for Patient Safety

It refers to whether hospital management provides a work climate that promotes patient safety and shows that patient safety is a top priority. It was measured by 3 items; ^[1] Hospital management provides a work climate that promotes patient safety; ^[2] The actions of hospital management show that patient safety is a top priority; ^[3] Hospital management seems interested in patient safety only after an adverse event happens. Each item has five response categories ranging from strongly disagree ^[1] to strongly agree ^[5]. Hospital Management Support for Patient Safety is operationalized as the participants score on Hospital Management Support for Patient Safety dimension on HSOPSC.

Teamwork across hospital unit

This domain refers to whether hospital units cooperate, coordinate with one another and encourage teamwork among staff from other units to provide the best care for patients. It was measured using four items considering four different scenarios (Hospital units do not coordinate well with each other, There is a good cooperation among hospital units that need to work together, It is often unpleasant to work with staff from other hospital units, and Hospital units work well together to provide the best care for patients). It was measured by asking respondents to evaluate these issues on 5- point Likert scales (1 strongly disagree to 5 strongly agree). It is operationalized as the participants' score on teamwork across hospital units dimension on HSOPSC.

Non-punitive Response to Error

It measures whether staffs feel that their mistakes and event reports are not held against them and that mistakes are not kept in their personnel file. It was measured by using two items; ^[1] staffs feel like their mistakes are held against them; ^[2] when an event is reported, it feels like the person is being written up, not the problem. It was measured by asking respondents to evaluate these issue on 5- point Likert scales (1 strongly disagree to 5 strongly agree). Non-punitive Response to Error is operationalized as the participants score of Non-punitive Response to Error dimension on the HSOPSC.

Organizational Learning—Continuous Improvement

It refers to whether mistakes have led to positive changes and changes are evaluated for effectiveness. It was measured using three 5 point Likert scale items (1 strongly disagree, to 5 strongly agree); ^[1] we are actively doing things to improve patient safety; ^[2] Mistakes have led to positive changes here; ^[3] After we make changes to improve patient safety, we evaluate their effectiveness. Above 75 composite score was considered as positive attitude towards this dimension. Organizational Learning—Continuous Improvement is operationalized as the participant's score on the Organizational Learning—Continuous Improvement dimension on the HSOPSC.

Staffing

It refers to how the staffs perceive their working area in terms of staff and related conditions (number of staff, type of staff, working hour). It is to assess whether there are enough staff to handle the workload and work hours are appropriate to provide the best care for patients. It was measured using four items; ^[1] we have enough staff to handle the workload; ^[2] staff in this unit work longer hours than is best for patient care; ^[3] we use more agency/temporary staff than is best for patient care; ^[4] we work in "crisis mode" trying to do too much, too quickly. Respondents were asked to rate their perceptions about these issues from 1(strongly disagree) to 5(strongly agree). Staffing is operationalized as the participant's score on the Staffing dimension on the HSOPSC.

Supervisor Expectations & Actions Promoting Safety

This domain assesses whether supervisor/manager expectations and supervisors/managers consider staff suggestions for actions promoting patient safety, improving patient safety, praise staff for following patient safety procedures, and do not overlook patient safety problems. It was measured using a scale of four items. These are; ^[1] my supervisor/manager says a good word when he/she sees a job done according to established patient safety procedures; ^[2] my supervisor/manager seriously considers staff suggestions for improving patient safety; ^[3] whenever pressure builds up, my supervisor/manager wants us to work faster, even if it means taking shortcuts; ^[4] my supervisor/manager overlooks patient safety problems that happen over and over. Each item has five response categories ranging from strongly disagree ^[1] to strongly agree ^[5]. Supervisor Expectations & Actions Promoting Safety is operationalized as the participant's score on the Supervisor Expectations & Actions Promoting Safety dimension on the HSOPSC.

Measurement

For each patient safety culture dimensions, participants' score on the dimensions ≥ 75 were considered as positive responses ^[56]. The proportion of participants whose score is ≥ 75 gives percent positive response (Positive Response Rate/PRR/) for each dimension.

For the outcome variable "incident reporting", the proportion of participants whose score ≥ 75 were those who has high frequency of incidents reporting, those score ≥ 50 & < 75 were who had moderate frequency of incident reporting, those whose score ≥ 25 & 50 were who reported incidents rarely and those whose score < 25 were those who never reported an incident.

Data analysis

Descriptive statistics including means and standard deviations was used to describe participants' characteristics, perceptions of patient safety cultures, and incident reporting. Most of the items in the questionnaire use a 5- point Likert scale such as scale of agreement (strongly disagree=1 to strongly agree=5) or scale of frequency (never=1 to always=5). Each of the five responses would have a numerical value ^[1-5], in which the highest two scoring answers ^[4-5] are perceived as positive response answers, while the lowest three scoring answers ^[1-3] are considered as neutral and negative response answers. Negatively worded items in the survey were reverse coded to ensure that positive answers indicate a higher score. A numeric value was assigned to the response to each Likert scale questions, from 1-5 (1, for strongly disagree, to 5, for strongly agree for positively worded questionnaire and 1, for strongly agree to 5, for strongly disagree for negatively worded questions) A variety of statistical techniques were applied to compute the findings from the survey data. Frequency distributions were used to organize the data and present the responses obtained. The guidelines proposed by AHRQ were first used to analyze and interpret the respondents' perceptions on patient safety culture composites.

For each patient safety culture dimensions, the mean of the responses was calculated by adding the Likert scale responses of the individual for the respective dimension and dividing by the number of items under that construct (dimension). E.g. the dimension "staffing" has 4 items. If the response of the individual response is strongly agree ^[5] for the first item, disagree for the second item ^[2], agree for third item ^[4] and agree ^[4] for fourth item, to calculate the score of this respondent over the dimension "staffing" the responses were added and divided by the number of items:-

$$\text{Mean score for the respondent} = \frac{5+2+4+4}{4} = 3.$$

To calculate the Safety Culture Scores for each dimension: 1(one) was subtracted from the safety climate mean of each participant. Then the result was multiplied by 25 to convert to a 100-point interval scale. Because, the Likert scale data were analyzed as an ordinal data and needs to be transformed in to interval scale for regression analysis. The result is the safety culture dimension score for that respondent, which was between 1 and 100. From the above example, ^[3-1]* 25=50(the participant score on this dimension). All the safety culture scores were calculated by repeating this procedure. Based on the following general

formula, Safety culture Scores were calculated for the rest of the participants.

Formula to calculate Score of patient safety culture dimensions for individual respondent=

(mean score of the dimension for the individual-1)* 25(1).

Example, if the mean score for the dimension “hospital management support” is 4.5, then, its score will be calculated as (mean score-1)*25= (4.5-1)*25= 87.5. This was repeated for all participants’ score for all dimensions patient safety culture.

After calculating the dimensional score, to get what proportion of the participants have dimensional score of ≥ 75 , the number of participants who have score of ≥ 75 were divided by the total number of participants. Higher scores indicate more positive attitudes toward patient safety culture. Patient safety strengths are defined by AHRQ as those items that about 75% of the respondent’s patient safety culture dimensional scores is ≥ 75 .

Reliability test was performed using the patient safety dimensions involved in measuring patient safety culture and Cronbach’s alpha was calculated. The cronbach’s α was between 0.69(over all perception on patient safety) and 0.89(teamwork within units).

To reduce concerns about multi-co linearity, variance inflation factors (VIF) and tolerance test were used. Accordingly, all tolerance values were greater than 0.1 and all VIF values were less than 3.0, meaning that any significant relationships found are not inflated by correlations between the predictor variables. Multiple linear regression was applied to know the predictors of incident reporting. This technique allowed us to enter a fixed order of variables to control for the influence of the covariates so that we can isolate the effects of the perceived patient safety culture predictors of incident reporting behavior. We first entered the eight covariates into the regression model as baseline predictors for incident reporting behavior. Finally, patient safety dimension scores were entered in to the regression model.

Ethical consideration

Ethical approval was obtained from Institutional Review Board (IRB) of Jimma University Institute of Health to conduct the study. Permission was requested from each hospitals and verbal consent was requested from each study participant. After the proposal is reviewed by each hospital’s IRB, ethical clearance was obtained from each hospital. Participants had had full right to participate or refuse participation in this study. The aim of the study was clearly stated on the questionnaire to participants and hospital officials. The data collection was begun after obtaining consent from each participant. Confidentiality was maintained by excluding the names of participants from questionnaires. No other person except the data collection facilitators and the principal investigator had access to the filled questionnaires.

Results

Socio-demographic characteristics of the respondents

Out of the total 691 survey questionnaires distributed, 578 were returned with response rate of 83.6%. Majority (63.4%) of the respondents were males while the remaining 36.6% were female health care providers. The mean age of

the participants was 29.06 (\pm 4.893years). Regarding the job role of the respondents 249 (49.9%) were nurses followed by physicians 140 (24.2%). Majority of the Participants (86.9%) had working experience of 1 year to 10 years. Three hundred twenty six (56.3%) participants reported as working in the hospital from 40-59 hours per week. Concerning the educational level of the participants, there were a large number of BSc degree holders among the health care providers (78.8%, N=456) followed by diploma holders 65(11.2%). Ten percent of the respondents have master’s degree and above. As shown in the table 1.

Reliability and multi-collinearity test on HSOPSC tool

Reliability test was performed using the patient safety dimensions involved in measuring patient safety culture and Cronbach’s alpha was calculated. The cronbach’s α was between 0.69(over all perception on patient safety) and 0.89(teamwork within units). They are within the recommended ranges^[1]. To reduce concerns about multi-collinearity, variance inflation factors (VIF) and tolerance test were used. Accordingly, all tolerance values were greater than 0.1 and all VIF values were less than 3.0, meaning that any significant relationships found are not inflated by correlations between the predictor variables. As shown in table 2.

Patient safety culture score for each dimension: -

The mean proportion of positive responses for the safety dimensions of the HSOPSC varied from 28.4% to 57.8%, and the mean scores from 2.88 (SD 1.00) to 4.32(SD 0.97) dimensions of the safety culture. The two safety culture dimensions with the highest positive scores were ‘team work within units (79.8%) and ‘teamwork across hospital units’ (77.9%). The five indices of patient safety culture that were least recognized included communication openness (32.6%), ‘hand-offs and transitions’ (20.4%), ‘staffing’ (57.7 %) and ‘non-punitive response to error’ (36.2%), management support for patient safety (33.5%). As shown in Table3.

Incident reporting behavior: - In this study, 20.4% of the participants never reported an incident, 13.1% reported rarely, 19.9% reported sometimes. Only 30.4 % of respondents reported incidents always. The overall mean aggregated score for the frequency of events reported was 3.05(SD=1.21), indicating that health professionals in each hospital, on average, reported incidents at a frequency of “sometimes” to “most of the time” basis.

Respondents character as Predictors of incident reporting behavior

Respondents personal variables such as sex, age, duration of experience in hospital unit, duration of experience in work unit, staffs’ job role accounted for 3.4 % of the variance in the frequency of events reported by the participants (R square =0.030). Duration of experience in the current hospital unit which were ranged from 6 to 10 years was associated with decreased frequency of incident reported (β =-0.109, P=0.009). Moreover, duration of experience in the current hospital working unit which were ranged from 11 to 15 years was associated with increased frequency of incident reporting (β =-0.160, p <0.001). Working experience in the hospital at large which were ranged from 6 to 10 years was associated with decreased frequency of

incident reporting ($\beta = -0.09$, $p=0.03$). Hospital work experience range of 21 years and above was associated with an increased frequency of incident reporting ($\beta=0.091$, $p=0.029$).

Significant association were observed for the job role (administrative staffs) taken together with incident reporting score. Being administrative staff was associated with a higher frequency of incident reporting ($\beta = 0.127$, $P= 0.002$). Working hours which were ranged from 20 to 39 hours ($\beta=0.092$, $p=0.027$) and 60 to 79 hours ($\beta=0.113$, $p=0.006$) were associated with a higher frequency of frequency of incident reporting. Similarly, staffs working 100 hours and above per week were associated with decreased frequency of incident reporting ($\beta=-118$, $p=0.004$). As shown in table 4.

Dimensions of patient safety culture as predictors of incident reporting behavior

Bivariate analysis was done between frequency of events reported and each PSC dimensions. In this part the effect of each independent variables/safety culture dimensions (overall perceptions of safety, hospital handoffs and transitions, non-punitive response to error, organizational learning and continuous improvement, management expectation and support to patient safety, communication openness and feedback about error and teamwork across and within hospital unit) were tested for association on frequency of events reported. Accordingly, hospital handoffs and transitions was associated with an increasing frequency of incidents reporting ($\beta=0.271$, $p=0.001$). Non-punitive response to error was associated with an increasing frequency of incident reporting ($\beta = 0.545$, $p<0.001$). Organizational learning and continuous improvement was associated with an increasing frequency of incident reporting ($\beta=0.641$, $p<0.001$). Similarly, communication openness was associated with an increasing frequency of incident reporting ($\beta=0.742$, $p<0.001$). Moreover, management expectations and support to patient safety was associated with an increasing frequency of incidents reporting ($\beta=0.768$, $p<0.001$). Feedback about error was associated with a higher frequency of incident reporting ($\beta=0.685$, 001) and teamwork within hospital units were associated with an increased frequency of incident reporting ($\beta=481$, $p <0.001$). As shown in table 5.

Overall Predictors of incident reporting behavior

To determine the factors affecting incident reporting, a regression model was built using "frequency of events reported" as the dependent variable and patient safety dimensions, socio-demographic characteristics (gender, educational status, staff job role, respondents' experience) as independent variables. The categorical variables (staff job role, gender, and educational status) were transformed into dummy variables. The socio-demographic characteristics of the respondent explain 12% of the variation in the frequency of events reported. The patient safety culture dimensions accounted for 52.8% of the variation in incident reporting.

Duration of experience in working hospital ranged from 6 to 10 years was associated with decreased frequency of incidents reported ($\beta=-.257$, $p= .003$). This implies that respondents whose experience in work hospital ranged from 6 to 10 years had 0.302 higher score for event reported than respondents experiences ranged from 1 to 5 years.

Respondents whose experience in the current hospital unit

ranged from 6 to 10 years was associated with a higher frequency of incident reporting. This implies that respondents whose experience in current hospital unit ranged from 6 to 10 years had 0.359 higher score for incident reported than respondents experience ranged from 1 to 5. Respondents who work for 20 to 39 hours from 20 to 39 was associated with decreased frequency of incident reporting ($\beta=-.255$, $p<0.001$). This implies, respondents who work for 20 to 39 hours per week had .255 less score for incident reporting than respondents who work for less than 20 hours per week.

After multivariate regression, several culture variables were significant predictors of incident reporting. The incident reporting showed that a unit increase in the score of the dimension "feedback about error" increased by 0.14(95% CI= .041,237). For 10 % increase in the dimension of "feedback about error, there was 14 % increase in the score of incident reporting frequency. Similarly, incident reporting behavior increased by 0.33(95%CI=211,439) for a one unit increase in the score of the dimension "hospital managers/supervisors actions and expectations". Moreover, a one unit increase in the score of the patient safety culture dimension "communication openness" increased the incident reporting behavior by 0.155(95%CI= 062, 249). A one unit increase in the score of the patient safety culture dimension "non-punitive response to errors" increased the incident reporting behavior by 0.23(95%CI=168, 292). As shown in table 6.

Discussion

In this study, 20.4% of the participants never reported an event, 13.1% reported rarely, 19.9% reported sometimes, 30.4% (95% CI=23.8, 36) reported most of the time all incidents types of incidents always. The study conducted in Northeast Region of Us shows that 72% of the participants reported patient safety events in all situations^[58]. There is a big difference when compared with our study. This difference might be due to the difference in the socioeconomic status of the two countries and the difference in the perception of the importance of event reporting for quality health care among the health care providers in those countries.

The overall perception of patient safety culture positive response for this study was 56.6% (95%CI=54.1-58.3). It is higher when compared with the same study conducted in Netherlands (52.2%)^[59]. this might be due to the difference in study design and sample size difference between these studies. Another study conducted in Oman, reveals that overall average positive response rate patient safety culture dimensions of the HSPSC survey was 58%.^[61], which is consistent with this study. This similarity might be due to the similarities in staffing and hospital infrastructure between countries.

In this study 'teamwork within hospital unit/department' was area of strength with positive response of 79.8% (95%CI=76, 85.4). This is in line with the study conducted in Taiwan (84.8%)^[63]. It could be due to the fact that persons working closely together, like in one specific unit or department, may rate teamwork items focused on themselves more highly.

The dimension "teamwork across hospital units/departments was also one of areas of strengths with positive response of 77.9% (95%CI=.69.8, 84) It is higher when compared to the same study conducted in Taiwan (65.9%)^[63]. This

difference could be due to the difference in socio-cultural values and study design. The study in Taiwan was total survey and this study was by simple random sampling method. The same study conducted in New York showed 42.35% positive response for teamwork across hospital units (18). This difference could be due to the small sample size and due to sampling methods employed in this study compared with the aforementioned study. The other possible explanation could be due to the fact that the organizational structure of hospitals in developed countries is very much divided in many specializations in which professionals are less disposed to collaborate and are focused on the achievement of specific tasks.

“Overall patient safety” was rated 67.6% (95%CI=64.2, 69.1) positive responses. Staff perceives that there is a moderate safety practice in the hospital. This study shows considerable high positive responses to overall patient safety compared to New York (49.74%)^[18]. This might be due to actually less adverse events taking place or under reporting of such incidences. Staff may not report all the adverse events or may not fill the questionnaire sincerely aiming to protect the hospital from getting a bad reputation. The study conducted in Egypt showed 33.9% positive response for “overall patient safety” dimension^[69]. This could be due to the difference in perception of patient safety practices by the health professionals between the two countries.

The overall positive response rate for this study on the Non-Punitive Response to Error dimension was 36.2% (95%CI=34.0, 38.1) lower than the positive response rate (43%) for US hospitals, although an area for improvement in US hospitals as well. As in this study, results from the AHRQ studies indicated that most US hospitals reported Non-Punitive Response to Error as the lowest dimension. Findings from this study indicate that health care providers do not feel free to report errors or issues related to patient safety. This may be due to many reasons such as fear of punishment, blame, and potential for shame which are reasons documented in the literature related to error reporting. But, when compared with the study conducted in Cairo, Egypt (19.5% positive response for non-punitive response to errors^[69]) it is considerably high. This difference might be due to socio-cultural differences between these countries.

In this study, hospital handoffs and transitions of patients have a positive response of 20.4% (95%CI=16.04, 27). Another study conducted in US hospitals showed 44%^[68] positive response for handoffs and transitions dimension. This difference could be due to the difference in perception of patient handoffs and transition between the two countries. Based on that, there is high risk for health care providers to miss information and data related to patients' situations during shift change or during the transfer of the patient from one department to the other. Ineffective handoffs can contribute to gaps in patient care and breaches failures in patient safety, like medication errors, wrong-site surgery and patient deaths. This depends on the communication between the sender and the receiver and their responsibilities.

The overall positive response for the dimension “Communication openness and feedback” was 32.6% (95%CI=24.1, 38.8). According to the study undertaken in New York, communication openness scored 60.5% of positive responses^[18]. In Ethiopian culture, open communication about adverse events can possibly be

hindered by formality, respect, and interpersonal harmony. One of the most problematic points is that subordinates do not normally express disagreement or uncertainty, especially with persons of higher status, to avoid confrontation or signs of disrespect. The other reason could be avoidance of conflict and fear of legal liability for mistakes done. Another study conducted in two East African hospitals identified obstacles to patient safety, among those obstacles, was poor communication along different hierarchies. Although staff generally felt there was a good level of cooperation within departments, weak communication between professions and across hierarchies was frequently described. According to this study, hierarchical dynamics contributes to elite groups, such as doctors, feeling that they could flout patient safety rules with impunity, since they did not recognize those beneath them as having the authority to control or sanction their conduct^[56].

In this study the dimension “Organizational Learning - Continuous Improvement” has positive response of 49.1% (95%CI=42.7, 56) which is lower than the study conducted in New York Hospital that was 68.37%^[18]. Organization learning – continuous improvement scored (82%) highest positive responses in a study carried out in an Acute Hospital Setting in Dubai^[64], and the second rank in Sri Lankan set up (82.5%)^[63]. This might be due to the difference in the hospital and health care providers' culture. This study insight that the hospitals are proactive compared with the other studies. This could be either the hospitals in this study are good at anticipating errors and prevention of errors rather than reaction to errors after they occur or the hospitals did not use errors as an opportunity to learn from mistakes. The study conducted in Cairo, Egypt showed 78.2% positive response for the organizational learning-continuous improvement. That means there is a learning culture only when mistakes are disclosed^[69].

In this study the dimension ‘staffing’ has score of positive responses 57.7% (95%CI=47.9, 62.6) which is higher as compared to the New York hospitals (39.12%)^[58], in Taiwan (39%)^[65] and in Dubai (32%)^[56]. This might be due to the special attention paid by the Ethiopian government on training of health care providers to achieve the goal “health for all by 2020”. The other possible explanation could be the difference in health care utilization behavior of the population of these countries may differ and this may have effect on the workload of staff. The study conducted in two government hospitals of East African countries on 57 hospital staffs showed low staffing level^[56]. This difference might be due to the difference in the research design and the small sample size employed in the former study conducted in East African countries or time period difference between the studies.

Overall positive response to incident reporting was 30.4% (95%CI=26.4, 33.9). According to AHRQ guideline frequency of incidents reported in these hospitals is area that needs to be improved. Frequency of incident reporting found in the study in New York was 47.72%, which is higher than this study^[18]. This could be due to the difference in the perception of the importance of error reporting by health care providers and the difference in legal liabilities and punitive culture of the health care organizations involved in this study. This view is supported by 36.2% positive responses to non-punitive response to errors. In other words staff is scared to report errors. Not having a non-punitive response to errors causes under

reporting. This indicates there may be a strong blame culture in the hospitals where the active end is blamed and errors are not seen as opportunities to learn. When compared with the study conducted in Dubai, the least positive response was obtained by non-punitive response to errors (22%) while in this study it received a higher positive response (30.4%). This might be the cultural differences between countries. In both cases, the findings suggest that there is less attention for incident reporting in the studied hospitals.

Our study also provides partially support for our adapted conceptual model that enabling and elaborating actions can influence incident reporting. We found that enabling and elaborating stage of this model had at least two factors that were statistically significantly associated with incident reporting. First, we found that three of the six activities (hospital management support for patient safety, Supervisors expectations and actions promoting safety and non-punitive response to errors) we classified as enabling were significantly associated with incident reporting. The activities we classified as enacting exhibited no statistically significant associations with incident reporting. Finally, the activity we classified as elaborating, feedback and communication about errors and organizational learning was also significantly associated with higher frequency of incident reporting. Among the enabling patient safety cultures for incident reporting, the hospital management support for patient safety, Supervisors expectations and actions promoting safety and non-punitive response to errors, were significant predictors of incident reporting frequency. This was in line with the study conducted in Norwegian Hospital Trust on association of incident reporting culture and dimensions of patient safety culture [66]. These findings are consistent with previous research conducted in USA that examined these relationships in hospital employees and found positive relationships between the patient safety culture dimensions and incident reporting behavior [67].

Hospital management support for patient safety is the second strongest predictor of incident reporting behavior. Many organizations have been challenged to provide an environment in which it is safe to admit errors and understand why the errors occurred [11]. When strong hospital leaders and managers create a culture and commitment to solve underlying system causes of medical errors and harm to patients, the whole organization will follow and thus disclosing real or potential adverse events and finding their root causes will become an organizational process [45]. The positive associations between safety practices and reporting of incidents by health care providers in this study support that theoretical premise.

The study shows that non-punitive response to errors is the third strongest predictor of incident reporting behavior. Other studies show that health care professionals report feeling worried, guilty, and depressed following serious errors, as well as being concerned for patient safety and fearful of disciplinary actions and they are aware of their direct responsibility for errors [6]. Self-reporting errors can be thwarted by several factors. First, clinicians fear career-threatening disciplinary actions and possible malpractice litigation and liability [7, 8]. Health care leaders who do not protect reporters of errors from negative consequences reinforce this fear, as does the criminalization of fatal health care mistakes [9]. Fear of these negative consequences can

lead to reporting errors only when a patient is harmed or when the error could not be "covered up" [10]. Second, clinicians working in a culture of blame and punishment do not report all errors, primarily because they fear punishment. Many organizations have been challenged to provide an environment in which it is safe to admit errors and understand why the errors occurred [11]. This study showed that there is no statistically significant association between the enacting activities of patient safety culture with incident reporting behavior of the health care providers. But, the study conducted in US Hospitals showed that enacting activities are relevant even though they do not have as much effect as the elaborating activities of patient safety culture dimensions. This difference might be due to the smaller sample drawn for this study compared with the previous study. The elaborating actions, error feedback and communication about errors, and organizational learning, had the greatest effect on high frequency of error reporting. The study conducted in American Hospitals by Jason Paul Richter also identified these elaborating patient safety culture dimensions as a key predictor of incident reporting behavior of health care providers [68].

Feedback about error and communication openness has previously shown to be a predictor for incident reporting in a survey of the safety culture in a Swiss University Hospital [69]. In a survey among pharmacists in the US hospitals, communication openness was conducive to reporting medical error [67]. Another study conducted in Norwegian community hospitals and on perception of just culture have shown that lack of feedback is perceived as a barrier for incident reporting [65]. Another study conducted in Saudi Arabia Hospitals showed that Feedback & communication about error, Non-punitive response to error, and communication openness dimensions were significant predictors of frequency incidents reported [56].

The study highlights the importance of enabling and elaborating activities of patient safety culture in encouraging staff to report incidents. Accordingly, Feedback about error, management support for safety, non-punitive response, hospital manager/supervisor expectation and actions promoting patient safety and communication openness were the most predictive patient safety culture dimensions for the outcome assessing the incidence reporting.

Conclusion

The findings of this study provide insights for hospital leaders as they work to improve incident reporting rates. To increase the frequency of reported incidents, this study suggests prioritizing efforts to improve event reporting feedback mechanisms, communication regarding systems and process changes made in response to submitted event reports, voicing support for safety by top-level hospital leadership and non-punitive response to errors.

Competing interests

The authors declare that they have no competing interests.

Authors' contribution

Shewangizaw Hailemariam designed the study, trained data collectors and managed data collection. Agegnehu Wubetu and Genetu Amare conducted the statistical analysis and drafted the manuscript and provided input into data analysis and overall study progress. All authors reviewed, edited and approved the final manuscript.

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