

Developing and validating a patient monitoring flow sheet in intensive care units

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ABSTRACT

Background: Intensive care unit is a center to provide comprehensive care for critically ill patients whose condition can be improved by receiving specialized care. The importance of accurate and rapid monitoring of patients at this precise moment is in recording patient data and its comparison with previous data. Monitoring the patient by either devices or direct examination of the nurses requires accurate documentation. Hence, accuracy of the documentation is essential to enhance the quality of care, despite the high volume of data in intensive care unit.

Materials and Methods: This study was conducted by review of domestic and international texts through Delphi method. There were 20 participants in Delphi stage. Data were collected by the questionnaires sent in two stages. Experts' panel was used to complete and finalize the obtained structures. Data analysis was conducted by descriptive statistics in the form of frequency percentage.

Results: In a review of 15 domestic and international flow sheets as well as 30 reference texts and 80 articles, 99 primary flow sheet structures were detected, of which 58 had a consensus of >70%. With the goal of avoiding repetition and making the recordable data brief, and with respect to the nurses' initial assessment in better planning and administration of care, a flow sheet was designed as a nursing admission sheet to be completed at the moment of admission. Its content and template had consensus among the panel of experts, and the instruction for complement of the sheets was finally developed.

Conclusions: After obtaining content validity and including the given indications, daily monitoring sheet and admission sheet were developed.

Key words: Delphi, intensive care unit, Iran, monitoring and assessment, nursing daily monitoring sheet, nursing intervention, nursing note

INTRODUCTION

Intensive care unit (ICU) is a center for holistic care for critical patients who should be treated and cared by professional interventions. Holistic and general care of critical patients is provided in this ward.^[1] Care, given by advanced equipments and though use of experienced and skilled personnel, is safer and more efficient. The existing facilities speed up the trend of care administration.

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health team can detect physiological crisis through timely monitoring of hemodynamic status and prevent damage of vital organs in patients. Importance of patients' precise and rapid monitoring in these centers depends on precise and momentary record of hospitalized patients' data and their comparison with the previous ones.^[2]

As the first principle of critical care is prediction,^[3] importance of monitoring in prediction of nursing care is highlighted. Diagnosis of the existing risk and danger for the patients and administration of preventive interventions before the event is among the primary principles in nursing. Patients' prognosis is associated with determination of precise changes and the timely related decisions to be made.

Monitoring of patients' vital organs is a major part of nursing interventions. As the values, assessment indexes, and patients' monitoring either by electronic devices or through nurses' direct examination require precise recording, precise record is essential to improve the quality of care despite the high load of data in ICUs.^[1] Nurses are responsible for monitoring and recording the findings, as their first main role is reporting the patients' condition trend and treatment.

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Nurses decide on what and how to record findings, based on their judgment on patients' clinical conditions.^[4] Nowadays, through development of nursing process, nurses' record has developed as an activity framework and a necessary tool to provide and evaluate nursing and treatment care. Recording documents are one of the important and written evidences in patients' medical record, which show the trend of treatment care and the actions and reactions which have happened in this trend.^[1]

Therefore, nurses in critical care units have a specific care record flow sheet in which they constantly record all the findings obtained through their investigations.

Nursing interventions' and patients' monitoring flow sheet has been designed as a single-page note for a 24-h record in which all existing structures are recorded in their real time.^[5] The data are recorded in either written form or as a diagram to be available for all treatment team members. One of the goals of such a flow sheet in ICU is saving time.^[6] Jive (2011) believes that use of a patients' monitoring flow sheet in ICU results in saving evaluation time by 2-3 min for each patient who is visited by a physician and a nurse.^[7,8] This time of care, which is saved, leads to an increased level of job satisfaction, makes the load of work tolerable for nurses, and consequently, enhances their carefulness in recording the related values. It should be noted that the consumed time for each care is so important; therefore, the consumed time in recording nurses' care is considered as one of the basic measurements for nurses' load of work in managerial systems. Reports and recording as a part of indirect care related work comprise 20% of all nursing activities in each shift.^[9] Research shows that each nurse makes 25% of error in recording patients' monitoring flow sheet and nursing interventions, including calculation errors and deletion of data or making unreadable data, in a 2-h shift.^[10] Mason (2008) believes that reduction of errors in recording from 15% to 6% in the years 2003-2004 resulted from the attention which was paid to the mode of recording, while no attention was properly paid to the quality of recording and its role in quality of care and mortality reduction. Nurses play a key role in promotion of care quality with which the improvement of services is directly or indirectly associated.^[12] The existing problems of data transfer reveal the necessity of precise recording, as 50-60% of physicians' clinical time is spent on verbal data exchange with nurses, which can disturb the interventions and care and accounts for 2.9-3.7 min, and this value becomes more in ICU.^[13]

Provision of the safest and the best care is the first step of caring principles in ICU,^[14] which can be achieved by nurses' precise recording to support the patients and to improve their quality of care.^[15] Shortage of standards in designing

patients' monitoring and nursing interventions' flow sheet, as well as lack of specific information needed by physicians in ICU can disturb the quality of care and, consequently, its recording. Nowadays, due to lack of coordination between the physicians and nurses,^[21] the use of patients' monitoring and nursing interventions' flow sheet in ICU leads to reduction of quality of given care and lack of success in the management of existing potential risks in defective recording. The way and manner of data transfer through flow sheet in ICU by the patients' bed, between the physician and nurse and other treatment team members, needs an agreement and coordination to improve the quality of care in patients.^[16]

The role of the components in flow sheet and its holistic approach with regard to nursing care principles are among the most important reasons for revision.^[22]

This study aimed to define nursing flow sheet structures and proposes a new arrangement of these structures. The existing flow sheet, despite being approved in the Vice Chancellery for treatment, has no clear history and is different in each hospital. Modification of this flow sheet with existing facilities and its applicability in Iran form the basis of the present study. The changes in the content of patients' monitoring flow sheet were made based on the indications of some specialists in Iran to improve the quality of patients' assessment through use of new tools to be applicable in most of the treatment centers.

MATERIALS AND METHODS

This is a classical Delphi design study, which was conducted during several stages. This study is based on the viewpoints of the experts concerning the need for each component in content or template of the monitoring flow sheet.

Stage one

At this stage, an organized manual and internet search was conducted to find the primary structures of monitoring flow sheet. Data up to 2012 were collected. Based on internet and library search through a systematic search by combination of words with "and" and "or," databases including ScienceDirect (Elsevier), Wiley-Blackwell, complete STM collection, Nursing consult, Oxford Journals Medicine, PubMed, and CINAHL were searched and the related English articles up to 2011 were selected based on the goal of the study and their relevance. Also, 13 samples of existing monitoring flow sheets used in national and international hospitals as well as nursing references were selected.

Stage two

Based on the findings obtained from systematic search of existing articles and reference books, the structures

were aggregated and categorized in a semi-structured questionnaire.

The first questionnaire contained eight sections related to patients' demographic characteristics, and necessary information such as blood group, and hospital and ICU hospitalization, as well as their referral history were collected. In the next section of the questionnaire, there were four sections based on body systems as structures of neurological, respiratory, cardiovascular, and hemodynamic monitoring, and nutrition and digestion. The section was related to recording the type of tests used in ICU as well as recording and monitoring the fluid intake, which were asked in the form of questions in two separate tables. There were a total of 99 structures in seven sections of the questionnaire. In section eight, the template of the sheet, language, color, and number of pages and other template-related features were asked in a written form.

The subjects were asked to confirm and explain the need for each structure in the general intensive care monitoring note. The column of the need for the structure was divided into parts of general intensive care and professional intensive care (in order to prepare separate general and professional intensive care monitoring notes).

Stage three

The obtained questionnaire was sent to a group of ICU professionals. The participants were selected through purposive sampling. The panel of experts comprised 20 members in the first stage, of whom 5 were anesthesiologists (3 of them had a subspecialty degree) and the rest were nurses with degrees varying from BS to PhD from Isfahan, Tehran, Yazd, Semnan, and Ahwaz (cities of Iran).

The questionnaires were sent through post ($n = 1$) or E-mail ($n = 6$) and the rest were handed over to the participants. Participants' consent was obtained through a phone call before sending them the questionnaires. The questionnaires were collected after 1 month and the contact with the participants was established by phone or E-mail.

Stage four

The returned questionnaires were reviewed by the research team. The structures with consensus $> 70\%$ were separated from the others. The structures with consensus 50-70% were revised in a five-point Likert's scale questionnaire in which the experts were asked to determine the priority of existence or absence of the rest of structures. The second questionnaire with a five-point Likert's scale was handed over to five available experts. The participants, at this stage, were four nurses and an anesthesiologist. After 10 days, the questionnaires were recollected and the structures'

consensus was calculated based on the analysis of experts' indications, and finally, Delphi stages ended.

Stage five

After obtaining the main structures and through use of other existing sheets, primary design of monitoring flow sheet was made and its arrangement was revised within several stages. Then, the obtained draft was sent to 10 experts of nursing and anesthesiology in Tehran, Yazd, and Shiraz (in Iran), and they were asked to mention their viewpoints concerning the template and content of the draft. After 2 weeks, the sent drafts were recollected, and the changes were made by research team members.

Stage six

In the last stage, the final flow sheet, designed in former stages, was reviewed by a panel of physicians and nurses who attended in the earlier stages and a consensus was reached.

RESULTS

Based on a systematic and manual search, there were 99 primary structures including 16 structures in sections of demographic characteristics, 22 structures in neurology monitoring, 22 structures in respiration monitoring, 10 structures in cardiovascular and hemodynamic condition monitoring, 3 structures in monitoring of digestive system and nutrition, 4 structures in ICU laboratory tests, and 22 structures in relation to intake/output.

Based on the questionnaire collected after the second stage, 61 constructs (61%) in the flow sheet obtained consensus $> 70\%$ (13 were related to demographic characteristics, 5 to monitoring of neurological values, 15 to monitoring of respiration, 4 to monitoring of cardiovascular status, 3 structures to monitoring of digestion and nutritional status, 4 structures were for laboratory findings, and 18 structures were related to monitoring of intake and output). Out of 38 remaining constructs with low consensus, 20 obtained 50-70% of consensus, which means that 50% of the participants believed that the existence of the structure was necessary in monitoring the flow sheet. About 20 obtained structures were put in a five-point Likert's scale and the rest with consensus of $< 50\%$ were deleted from the list of structures. Finally, 5 structures out of 20 structures of the questionnaire were ranked as 1-5 and the rest were deleted. Analysis of the results showed the structures including delirium with criterion of Confusion Assessment Method for the ICU (CAM-ICU), level of consciousness with criterion of full outline of unresponsiveness (FOUR), diagnosis of brain death, pupil diameter in eight sizes, criteria of disconnection from ventilation device and respiration function, recording respiration pattern, atrial BP, recording cardiac arrhythmia, recording of Intra-Aortic Balloon Pump (IABP) findings,

recording of specific drugs, recording of hemodialysis. In the fluid intake section, recording of cardiovascular disorders and pain management criteria were deleted due to obtaining a consensus of <70% again, and 10 final structures were included, so that a total of 70 structures obtained consensus in the flow sheet. Out of 99 structures, 51 were common in general and professional intensive care sections. Meanwhile, recording the level of EF (70%), level of ICP (72%), criterion of RASS (80%), muscular strength examination in four limbs (80%), gag reflex (70%), cornea reflex (70%), ratio of FIO₂/PaO₂ (81%), mean atrial pressure MAP (80%), ETCO₂ (72%), and CSF (81%) was included as the structures for special and sub-special intensive care. After obtaining the structures, primary suggested drafts were discussed and revised by the research team for six times. For the sake of simplicity and reduction of consumed time for completion and a rapid review of the flow sheet, some information including all the patients' baseline information, drugs and foods allergies, physical and body systems' examinations, vital signs, primary level of consciousness, and main neural, sensory, and psychomotor examinations were transferred to a note as admission note. Recording of all catheters and the date of their insertion, in addition to existence of pressure sore and other dermatological damages, level and manner of nutrition, admission weight, blood group, a section specified for nurses' special interventions during admission, various medical treatment services, and name of the patient's related physician was considered in this section. In the final session of stage six, patient's admission note was thoroughly changed and all the findings were formed in the frame of a nursing primary assessment note. In the final monitoring flow sheet, it was considered to record data of vital systems like respiratory system and vital signs, heart and hemodynamic condition, neural examination, nutrition, and 24-h intake/output in the three morning, evening, and night shifts.

On the back of the related note, a special place was considered for nurses' notes in two sections of medications record and nurses' note for three working shifts. Instruction to complete the flow sheet note was designed in a separate booklet, and all instructions of the previous measurement tools in the note were deleted from the main monitoring flow sheet and appeared briefly in the back of admission note.

DISCUSSION

Shortage of standards in designing patients' monitoring and nursing interventions' flow sheet and specific information needed by the physicians in ICU can disturb the quality of care and, consequently, its recording. Paying attention to the components of recording in the flow sheet and its holistic approach with regard to nursing care principles are among the reasons for the revision and modification.

Modification of the recording process in ICU and the necessity of revision of recording notes through basic researches can lead to more effective nursing care. Ninety-nine structures, obtained through systemic search of data banks as well as observation of existing national and international monitoring notes, were over 50% similar to the existing structures in other monitoring flow sheets. Some other structures such as pain management scale, recording of the results of some advanced modes of mechanical ventilation, and specific neural examinations, which did not exist in Iranian monitoring flow sheets, were added in the designed monitoring flow sheet after reviewing the existing information and based on the viewpoints of ICU experts. Physiological responses are directly associated with the outcome of treatment. Monitoring and interpretation of the effects of receiving oxygen through pulse oximetry, monitoring of structures associated with hemodynamic condition, and function of each of the body organ systems like the urinary system are effective in reduction of patients' mortality. So, precise recording of each structure related to monitoring of body's vital organs is among the most important and ultimate goals of prevention.^[13] Different tools had been suggested in relation with pain management, investigation of sedation and restlessness, as well as assessment of the level of consciousness in the first run of Delphi questionnaire, in which Glasgow Coma Scale (GCS), related to measurement of consciousness level, was agreed with a 72% consensus, although FOUR was deleted as it received only 20% of consensus. GCS, a known tool, is vastly used, although investigation of verbal response in intubated patients and/or investigation of brain stem reflexes is not possible while using this scale.

There are controversial studies on the relationship between the outcome of treatment and GCS in head injuries. So, FOUR was introduced in studies due to its ability in investigation of brain stem reflexes as well as respiration patterns.^[13] Lack of familiarity with this tool, the difficulty in using it, and high time consumption in its clinical use can be the major reasons for its deletion and lack of experts' consensus. This tool, in the direction of the research goal, got experts' consensus due to its modification and simplification in clinical use and in neurological review, while the rest were deleted. In order to complement of neurological examinations in patients hospitalized in ICU, the assessment of swallowing, cough, and corneal reflexes were included in the related flow sheet.

Among the other tools which did not get consensus were FLACC scale and RAMSAY scale of sedation and restlessness assessment. Importance of pain management in 1980-1990 led to designing pain investigation tools as well as a pain management guideline. The most important feature of pain management is to make pain understandable for which a

standard tool may help. The 0-10 scale to investigate the level of pain is a standard and sensitive tool in conscious patients.^[14] Use of pain management tools in patients under mechanical ventilation or hospitalized in ICU is of great importance as 71% of the patients hospitalized in ICU experience pain. Lack of communication with patients due to their low level of consciousness as well as existence of a tracheal tube or tracheostomy makes the pain assessment difficult. Lack of existing research related to pain assessment by nurses and incomplete recording of pain level in daily nurses' notes, lack of an appropriate protocol to manage pain,^[15] and the tools being in English language can be counted as the main causes for ignoring their use. Although pain assessment with a 0–10 scale is not yet applicable in patients under mechanical ventilation and those with low level of consciousness, it can act as a background for education of pain management and checking pain control through this tool to reveal its importance and establish its use through gradual use of this pain assessment tool. Although patients' mortality in ICUs is of a high percentage, timely diagnosis and emergent interventions in high-risk patients bring hope to prevent their condition from worsening. The clients who face a life-threatening disease or those who are predisposed to it can benefit from a safe and efficient care through numerous equipments existing in the ward.^[12] Since the first principle of critical care is prediction,^[7] the importance of monitoring in prediction of needed nursing care is highlighted. Prediction of mortality in ICUs is possible through collection of routine information like clinical and physiological findings in these centers. Retrospective research has shown signs of prediction of patients' worsening clinical condition in their related recording among the critical patients who died due to their bad clinical conditions.^[20] Use of acute physiology and chronic health evaluation (APACHE) in the assessment of patients' mortality was introduced in 1985.^[16] APACHE monitoring flow sheet of nursing interventions not only makes it possible to predict adult patients' condition, but also is measurable for all patients in ICU, and can be updated based on various studies.^[17] Use of this tool is possible and not time consuming as the structure is routinely recorded.

As all template and content components of a monitoring flow sheet were considered in this study, a notable number of new structures were included in the final flow sheet. This increase in the number of structures reveals more emphasis to be given on the issue of critical care. The equipments in ICUs have been improved, compared to previous years; also, the personnel providing health services in ICUs have increased scientific and practical ability. Conducting post-graduation courses like master's degree of critical care nursing and subspecialty of ICU is accompanied with the necessity of close attention to be paid to promotion of service quality, including more precise and better monitoring of the clients.

The duty of the treatment team is to use vast information, which may be sometimes recorded incorrectly in ICU, so that these findings are conveniently available during patients' hospitalization as one of the most important components of diagnosis and treatment. Through use of this flow sheet which enables patients' inter-professional assessment in monitoring patients' condition, we can have a more holistic and complete image of the changes occurring during patients' hospitalization, and based on this, in addition to taking advantages of inter-professional cooperation, a better nursing care can be administered. Ability to make an appropriate communication is one of the basic skills of social life. Importance of communication in human life is so high that some of the experts believe that the bases of human growth, personal damages, and human advances are rooted in communication process.^[11] Communication skills play a major role in patients' satisfaction and solving their problems in health-providing professions. In those who need long-term care, this issue is of greater importance. Doctors and nurses have a different understanding of patients' needs due to their various professional roles, which causes them to have a separate care plan, while the existence of an appropriate communication between doctors and nurses can lead to empowering them with planning of common goals.^[18] In addition, with regard to the positive attitude of graduate and undergraduate students in Iran and with respect to the importance of inter-professional education, application of this monitoring flow sheet can be considered in inter-professional education.^[22] Inter-professional education refers to a learning process during which the learners of two or more professions acquire information about one another, despite having an identical content, to improve the cooperation and the quality of given care. The belief in increase of patients' care efficiency through participation and team work increases international attention toward inter-professional learning in the domain of health sciences. Therefore, there is a high emphasis on the preparation of all students in health and treatment professions through inter-professional learning for their functions in their professions. This basically depends on the health team members' belief in the need to have interactions not only with the clients but also with their colleagues.^[19]

CONCLUSIONS

Use of precise monitoring and recording devices for the patients leads to reduction of their mortality as the health team can detect physiological crisis through timely monitoring of hemodynamic status and prevent damage of vital organs in patients. After obtaining content validity and including the given indications, daily monitoring sheet and admission sheet were developed.

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