Clearance of bronchial secretions after major surgery
Leur, Johannes Peter van de

IMPORTANT NOTE: You are advised to consult the publisher's version (publisher's PDF) if you wish to cite from it. Please check the document version below.

Document Version
Publisher's PDF, also known as Version of record

Publication date:
2005

Link to publication in University of Groningen/UMCG research database

Citation for published version (APA):
Discomfort and factual recollection in ICU patients

Johannes P. van de Leur, Cees P. van der Schans, Bert G. Loef, Betto G. Deelman, Jan H.B. Geertzen, Jan H. Zwaveling.

1 Center for Rehabilitation, University Medical Center Groningen, The Netherlands
2 Northern Center for Health Care Research, Groningen The Netherlands
3 University for Professional Education, Hanzehogeschool, Groningen, The Netherlands
4 Department of Health Sciences University of Groningen, The Netherlands
5 Departments of Cardio-Thoracic Surgery, University Medical Center Groningen, The Netherlands
6 Departments of Neuro-psychology, University Medical Center Groningen, The Netherlands
7 Departments of General Surgery and Surgical Intensive Care Unit, University Medical Center Groningen, The Netherlands

Published in:
Critical Care 2004, 8: 6, R 467-473
Discomfort and factual recollection

Abstract

Introduction

A stay in the Intensive Care Unit (ICU), though potentially lifesaving, is often considered to cause considerable discomfort to patients. However, retrospective assessment of discomfort is difficult because recollection of stressful events may be impaired by sedation and severe illness during the ICU period. The purpose of this study was to investigate the following questions: a) what was the incidence of discomfort reported by patients recently discharged from the ICU, b) what were the sources of discomfort reported, c) what was the factual recollection of their stay in the ICU and d) was discomfort reported more often in patients with good factual recollection?

Patients and methods

All ICU patients older than 18 years who had needed prolonged (>24 hours) admission with tracheal intubation and mechanical ventilation were included consecutively into the study. Within three days after discharge from the ICU, a structured face-to-face interview with each individual patient was held. All patients were asked to answer a questionnaire consisting of 14 questions specifically concerning the environment of the ICU they had stayed in. Furthermore, they were asked whether they remembered any discomfort during their stay and if so, which sources of discomfort they could recall. A reference group of surgical ward patients, matched by gender and age to the ICU group was studied to validate the questionnaire.

Results

In this study, 125 patients discharged from the ICU were included. Data of 123 ICU patients and 48 surgical ward patients were analyzed. The prevalence of recollection of any type of discomfort in the ICU patients was 54% (n=66). These 66 patients were asked to identify the sources of discomfort. The presence of an endotracheal tube, hallucinations and medical activities were identified as sources of discomfort. The median (min-max) score for factual recollection in the ICU patients was 15 (0-28). The median (min-max) score for factual recollection in the reference group was 25 (19-28). Analysis showed that discomfort was positively related to factual recollection (odds ratio 1.1, P<0.001), especially discomfort caused by the presence of an endotracheal tube, medical activities and noise. Hallucinations were reported more often with increasing age. Pain as a source of discomfort was predominantly reported by younger patients.

Conclusion

In post-discharge ICU patients 54% recalled discomfort. However, memory was often impaired: the median factual recollection score of ICU patients was significantly lower than the median factual recollection score of matched control patients. The presence of an endotracheal tube, hallucinations and medical activities were most frequently reported as sources of discomfort. Patients with a higher factual recollection score presented more risk of remembering the stressful presence of an endotracheal tube, medical activities and noise. Younger patients were more likely to report pain as a source of discomfort.
Introduction

Being admitted to an Intensive Care Unit (ICU) can be considered a stressful life event, the reason for admission being a critical or even life-threatening condition. The ICU stay itself may also be stressful. Some patients report vivid recollections [1-3] whereas others have a poor or even no recollection at all of their stay on the ICU. In a study among post-surgical patients, ‘no recollection at all’ ranges from 23% to 38% [4]. Various authors have reported that patients had unpleasant recollections after a stay on an ICU. Patients recalled discomfort like anxiety, pain, thirst, sleeplessness, disorientation, shortness of breath, inability to move, painful medical interventions, and the presence of an endotracheal tube [5]. Turner [6] specifically mentioned arterial blood gas sampling and endotracheal suctioning.

However, recollection of discomfort during the ICU stay is inseparably connected to the quality of recollection itself: events considered stressful at the time may not be remembered; conversely, recollections of stressful events may not be based on actual experiences. Jones and co-workers [7] investigated patients’ estimation of the duration of their ICU stay in order to evaluate the accuracy of their memories. The patients’ recall of events was generally poor, and 41% of them felt that they had been confused at some time during their stay in the ICU. To our knowledge, there is no literature investigating whether the recollection of discomfort is related to the accuracy of recollection of facts as such, and for what sources of discomfort this holds true. The purpose of this study was to describe:

- the incidence of discomfort reported by ICU patients,
- the sources of their discomfort,
- the factual recollection of ICU patients patients and ward patients,
- determinants of the recollection of discomfort in ICU patients.
Discomfort and factual recollection

Methods

Consecutive ICU patients, who were older than 18 years and who had undergone intubation for longer than 24 hours, were included in the study. During mechanical ventilation patients received sedation by continuous infusion of midazolam (range 1-4 mg/hour) and fentanyl (range 50-150 µg/hour), with the degree of sedation given depending on their clinical requirements. The patients participated in a study comparing routine endotracheal suctioning with minimally invasive airway suctioning. The study was approved by the Medical Ethics Committee of the University Medical Centre. The Acute Physiology Age and Chronic Health Evaluation (APACHE) II score was used to quantify the severity of illness [8] and was recorded on the day of admission to the ICU. All ICU patients participated in a structured in-person interview, using a standardized questionnaire, within three days after discharge from the ICU to the ward. The reference group consisted of post surgical ward patients, matched for age and sex. Data from the reference group were obtained in a structured telephone interview conducted within three days after discharge from hospital. In the questionnaire, all patients were asked to give answers to 14 questions concerning the ICU environment (lighting, timing of ward rounds, number of fellow ICU patients), the nursing staff (uniform, male/female) and personal care (clothing, position of intravenous drip, washing and toilet activities). Patients from the ICU group were asked whether they remembered any discomfort during their stay on the ICU, and if they did, they were asked to specify the sources of discomfort they remembered.

The questions regarding recollection of facts were first asked as open questions. For each correct answer two points were given to these open questions. Patients who were unable to answer the open questions were presented with four multiple choice answers. For each correct answer one point was given to the multiple choice questions. Summation of the points resulted in a total score for factual recollection. The range for the total score was 0-28 points.
Statistical analysis

SPSS version 10 (SPSS Inc., Chicago, IL, USA) was used to perform all analyses. To assess the reliability of the questionnaire, a Cronbach's alpha was calculated. Differences between the ICU group and the reference group were analyzed using the Chi square test for categorical variables and the T-test for normally distributed intervals or ratio scale variables. Differences between patients who recalled discomfort and those who recalled no discomfort were analyzed using the Chi square test in case of categorical variables, the Mann-Whitney test for ordinal variables and the T-test for normally distributed intervals or ratio scale variables such as age. To analyze potential determinants of discomfort, logistic regression was performed. The presence or absence of discomfort was entered as the dependent variable, and independent variables were as follows: age, gender, APACHE II score (only in ICU patients), length of stay in the ICU or ward, factual recollection score and duration of tracheal intubation. Correlation coefficients between factual recollection score and age were calculated using a Spearman's test for categorical variables.

From the logistic regression analysis, odds ratios (OR) were calculated for all independent variables in the equation. The OR expresses the odds in the group with the condition relative to the other group without the condition. To an extent, the OR can be considered a measure of relative risk. An OR greater than 1 indicates a higher risk and an OR below 1 indicates a lower risk in the group with the condition relative to the group without the condition.

Results

A total of 125 patients discharged from the ICU were included in this study. Two patients were unable to respond to the questions. Patient characteristics are summarized in table 1. In the population studied the prevalence of any discomfort recalled after discharge from the ICU was 54% (n=66). The sources of discomfort identified by these 66 patients are summarized in table 2.
Discomfort and factual recollection

Table 1. Patients’ characteristics.

<table>
<thead>
<tr>
<th>Patients’ characteristics</th>
<th>ICU-group n = 123</th>
<th>Reference n = 48</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, mean (sd)</td>
<td>61.5 (16)</td>
<td>60.2 (16)</td>
<td>0.617</td>
</tr>
<tr>
<td>Gender, male in %</td>
<td>71</td>
<td>65</td>
<td>0.435</td>
</tr>
<tr>
<td>APACHE II score, median (min-max)</td>
<td>11 (2 - 26)</td>
<td>na</td>
<td></td>
</tr>
<tr>
<td>Type of patient, in % trauma/ medical/ surgical</td>
<td>8 / 7 / 85</td>
<td>13 / 4 / 83</td>
<td>0.537</td>
</tr>
<tr>
<td>ICU stay in days, median (min-max)</td>
<td>6.5 (2 - 133)</td>
<td>na</td>
<td></td>
</tr>
<tr>
<td>Ward stay in days, median (min-max)</td>
<td>na</td>
<td>10 (3 - 53)</td>
<td></td>
</tr>
</tbody>
</table>

Table 2. Sources of discomfort.

<table>
<thead>
<tr>
<th>Sources of discomfort in ICU patients (n = 66)</th>
<th>in %*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Endotracheal tube</td>
<td>42</td>
</tr>
<tr>
<td>Hallucinations</td>
<td>32</td>
</tr>
<tr>
<td>Medical activities</td>
<td>29</td>
</tr>
<tr>
<td>Noise and bustle</td>
<td>14</td>
</tr>
<tr>
<td>Having pain</td>
<td>12</td>
</tr>
<tr>
<td>Thirst</td>
<td>9</td>
</tr>
<tr>
<td>Inability to talk</td>
<td>9</td>
</tr>
<tr>
<td>Shortness of breath</td>
<td>6</td>
</tr>
<tr>
<td>Being afraid</td>
<td>6</td>
</tr>
</tbody>
</table>

* Because patients could list more than one source of discomfort, the summation of percentages exceeds 100%.

At the time of the interview six patients were disorientated, but were able to recall discomfort.

The median (min-max) factual recollection score was 15 (0–28) in the ICU patients and 25 (19–28) in the reference group; the difference between the groups was highly significant (P<0.001). Analyses of reliability of the questionnaire for the ICU patients revealed a Cronbach’s alpha of 0.86, indicating high reliability. Items of factual recollection by ICU patients and the reference group, in descending order of being identified correctly, are listed in table 3.
Table 3. Factual recollection.

<table>
<thead>
<tr>
<th>Group</th>
<th>Correct %</th>
<th>Incorrect %</th>
<th>Don't know %</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ICU</td>
<td>reference</td>
<td>ICU</td>
</tr>
<tr>
<td>Type of patients' clothing</td>
<td>68</td>
<td>100</td>
<td>12</td>
</tr>
<tr>
<td>Gender of nursing staff</td>
<td>66</td>
<td>98</td>
<td>7</td>
</tr>
<tr>
<td>Place of intravenous access</td>
<td>65</td>
<td>98</td>
<td>11</td>
</tr>
<tr>
<td>Color of staff uniform</td>
<td>62</td>
<td>98</td>
<td>14</td>
</tr>
<tr>
<td>Number of fellow patients</td>
<td>62</td>
<td>71</td>
<td>8</td>
</tr>
<tr>
<td>Type of personal hygiene</td>
<td>62</td>
<td>98</td>
<td>7</td>
</tr>
<tr>
<td>Logo on staff uniform</td>
<td>55</td>
<td>88</td>
<td>5</td>
</tr>
<tr>
<td>Type of lighting</td>
<td>54</td>
<td>96</td>
<td>12</td>
</tr>
<tr>
<td>Reason inability to talk</td>
<td>50</td>
<td>94</td>
<td>24</td>
</tr>
<tr>
<td>Time of personal hygiene</td>
<td>48</td>
<td>100</td>
<td>3</td>
</tr>
<tr>
<td>Toilet visits</td>
<td>42</td>
<td>100</td>
<td>32</td>
</tr>
<tr>
<td>Alternative headstand positions of bed</td>
<td>42</td>
<td>92</td>
<td>18</td>
</tr>
<tr>
<td>Type of food received</td>
<td>23</td>
<td>100</td>
<td>54</td>
</tr>
<tr>
<td>Time of ward round</td>
<td>11</td>
<td>98</td>
<td>34</td>
</tr>
</tbody>
</table>

P value < 0.05 and ** p value < 0.005 from Chi square test between ICU patients and reference group.

ICU patients characteristics are summarized in table 4 separately for the group that recalled any discomfort and the group that did not recall any discomfort. Significant differences were found between the two groups in factual recollection, age and duration of intubation.

Table 4.

Patients’ characteristics of ICU patients with and without a recollecting of discomfort.

<table>
<thead>
<tr>
<th></th>
<th>Discomfort (n = 66)</th>
<th>No discomfort (n = 57)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, mean (SD)</td>
<td>59(17)</td>
<td>65(14)</td>
<td>0.004</td>
</tr>
<tr>
<td>Gender, male in %</td>
<td>65</td>
<td>77</td>
<td>0.143</td>
</tr>
<tr>
<td>Apache II score, median (min-max)</td>
<td>12 (2 - 26)</td>
<td>11 (5 - 24)</td>
<td>0.171</td>
</tr>
<tr>
<td>Duration of intubation, median (min-max)</td>
<td>5 (2 - 35)</td>
<td>3 (1 - 57)</td>
<td>0.001</td>
</tr>
<tr>
<td>Factual recollection score, median (min-max)</td>
<td>18 (0 - 28)</td>
<td>11 (0 - 24)</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

Logistic regression analysis of determinants of recollection of discomfort confirmed that factual recollection was indeed an independent factor in predicting recollection of discomfort. The calculated OR was 1.1 (P<0.001), with a correct percentage in regression analysis of 68%.
Discomfort and factual recollection

This implies that the risk for recalling discomfort was 1.1 times higher for each factual recollection point. Age also was a determinant of recollection of discomfort. The calculated OR was 0.97 (P=0.006; correct percentage in regression analysis 66%). This implies that the risk for recalling discomfort was lower by a factor of 0.97 for each year of advancing age. The duration of intubation appeared not to be independently related to the recollection of discomfort. Factual recollection appears to be inversely related to age. Analysis of the relationship between factual recollection score and age in the ICU group revealed that the correlation coefficient was -0.352 (P<0.001); in the reference group it was -0.327 (P=0.023; figure 1).

Finally, the recollection of pain appeared to be related to age (OR 0.936, P=0.002; correct percentage in regression analysis 94%). This implies that younger patients reported more recollection of discomfort in the form of pain.

Figure 1. The plot expresses Factual recollection score and Age in the ICU and control group.

Discussion

The results of our study show that a considerable proportion (54%) of patients discharged from the ICU had a recollection of discomfort during their stay in the ICU. The presence of an endotracheal tube, medical interventions, noise and experiences of hallucination were among the sources of discomfort most frequently reported. To our knowledge, this study is the first to evaluate the association between recollection of discomfort and intact factual recollection. In a study conducted by Rose and co-workers [9] in 50 patients, 60% remembered endotracheal suctioning, and 52% remembered extubation as unpleasant experiences. In a study by Turner and co-workers [6], arterial blood gas
sampling and tracheal suctioning were recalled by 48% and 44% of the patients. Although those two studies did not investigate the prevalence of discomfort per se, we conclude that their findings are similar to ours, in that discomfort was recalled by 54% of ICU patients.

Within the context of ICU patients’ recollections, a memory of an (stressful) event raises the question of whether this recollection is based on reality or fantasy/imagination. In the present study we found the degree of factual recollection to be an important determinant of discomfort, in the sense that more discomfort was reported by those with better factual recollection. Each item of factual recollection that was scored correctly increased slightly the risk for recollection of discomfort. Factual recollection and recollection of discomfort therefore appeared to be related.

In an ICU many factors contribute to impairment in memory: critical illness itself, the use of benzodiazepines and opioids, and the common occurrence of delirious states. When a patient’s health is improving or when sedative agents are reduced below effective levels, patients tend to remember more regarding factors, mostly unpleasant, in the ICU. Jones and co-workers [10] described many causes of amnesia during severe illness, including large dosages of sedative medication and withdrawal syndromes. Because levels of sedation strongly influence the function of memory, a weak point in our study is that no sedation score was recorded to enable us to evaluate the effects of sedatives on patient recollection. It should also be noted that we did not look for objective signs of post-discharge psychological distress or examine their relationship to memories of stressful events, either real or perceived. We merely wished to improve our understanding of discomfort by taking into account the confounding role of memory.

The presence of an endotracheal tube, medical activities, and noise and bustle were the sources of discomfort remembered most frequently (table 2). This finding is comparable with those of other studies. In a group of 68 ventilated medical patients, Turner and co-workers [6] found a prevalence of recollection of endotracheal suctioning of 44% and in 26 mainly surgical patients those investigators found a prevalence of recollection of endotracheal suctioning of 47% [11]. In a mixed surgical/medical group of cardiac patients (n = 50) Rose
Discomfort and factual recollection

and colleagues [9] found a 60% prevalence of recollection of endotracheal suctioning during the ICU stay.

The reason for discomfort relating to the endotracheal tube may be endotracheal suctioning. While intubated, patients are regularly suctioned via the endotracheal tube in order to maintain airway patency. The strong mechanical stimuli resulting from endotracheal suctioning may explain why the endotracheal tube is remembered as a prominent source of discomfort. In a previous study [12], we investigated the recollection of endotracheal suctioning with two methods of suctioning: Routine Endotracheal Suctioning and Minimally Invasive Airway Suctioning. In the case of RES, a 49 cm suction catheter was passed into the lower airways. With MIAS the suction catheter did not enter the lower airways and suctioning was limited to the endotracheal tube. A significantly lower prevalence of recollection of airway suctioning was found in the MIAS group (20%) than in the RES group (41%; P < 0.001). Our findings show that discomfort resulting from the endotracheal tube and its handling can be reduced by changing the procedure.

Hallucinations were another source of discomfort. In the total ICU patient group (n=123), 24 (20%; 95% confidence interval 13-23%) patients experienced hallucinations. This finding is comparable with that of an earlier and smaller study conducted by Holland and co-workers [2], who found that 10% of patients reported hallucinations. In a more recent study, Ely and colleagues [13] found that 81.7% of ICU patients developed delirium at some stage in their ICU stay. Delirium was an important variable, contributing as an independent predictor to higher 6-month mortality and longer hospital stay. Delirium was defined as 'a disturbance in consciousness characterized by an acute onset and fluctuating course of impaired cognitive functioning so that a patients' ability to receive, process, store and recall information is strikingly impaired'. Clearly, the presence of delirium according to this definition does not imply the presence of hallucinations. The exact percentage of patients who recalled hallucinations was not stated in the report by Ely and co-workers. In studies conducted by Puntillo [14] and Holland and co-workers [2], pain was reported as a source of discomfort as well. In a post-cardiac surgery population (n=24), Puntillo [14] described awareness of pain during the ICU period as a
significant problem. Holland and co-workers [2] reported that, in a group of post surgery patients (n=21), 71% had a recollection of pain. In our study of mainly surgical ICU patients, only 12% indicated that pain was a source of discomfort. Differences in type of sedation and pain medication, number of patients, inclusion criteria and type of questionnaire used are possible explanations for the low recollection of pain in the present study as compared with previous ones.

A standardized score to assess recollection in this type of patient was lacking at the time our study was performed. We developed a factual recollection questionnaire that may represent a reliable new tool to acquiring information regarding recollection of facts in post-ICU patients. Analysis of reliability revealed a high Cronbach’s alpha, and the descriptive data of our score showed a significant difference between ICU patients and the reference group. These findings are hardly surprising in view of the considerable differences between groups in severity of illness and consumption of hypnotics and sedatives. Further studies are needed to determine the validity and reliability of this instrument. Jones and co-workers [15] have since proposed a similar tool (Intensive Care Unit Memory tool), which has been validated in a number of settings [4,16].

Both good factual recollection and younger age increased the risk for discomfort. Factual recollection and age were inversely associated with each other, but this association was weak. The association of increasing age with reduction in memory function is widely recognized [17,18]. Although factual recollection and recollection of discomfort appear to be related, increasing the level of sedation is not necessarily the best way to prevent discomfort. Not only will deep sedation lead to increased length of stay in the ICU and prolonged ventilator dependency [19] but it may also have an adverse effect on the rate of post-traumatic stress disorder experienced by patients after their discharge from the ICU [10]. It has been proposed by various authors that factual recollection helps to offset the emotional impact of delusional memories [10,19] and may actually help to avoid adverse psychological outcomes in this type of patient. The development of drugs that can eliminate the emotional impact of stressful events in the ICU, while
Discomfort and factual recollection

preserving mental clarity and memory, might offer the best way to avoid long-
term psychological distress. Meticulous treatment of delusional states will also
contribute to this end.

Conclusion

In a series of patients discharged from the ICU, 54% recalled discomfort. The
most frequent sources of discomfort cited were presence of an endotracheal
tube, hallucinations and medical interventions. The median factual recollection
score for ICU patients was significantly lower than the median factual
recollection score for ward patients who had not been in an ICU environment.
Younger patients were at greater risk for remembering pain as source of
discomfort. Patients with better factual recollection had greater recollection of
discomfort. Factual recollection and age were inversely related, but this
relationship was weak.

Discomfort thus appears to be a serious problem for patients in an ICU
environment. Its prevalence is probably underestimated because retrospective
assessment of the degree of discomfort when the patient has been discharged
from the ICU is seriously handicapped by global or partial amnesia, caused by
critical illness, delusional states and the use of drugs.

However, the fact that discomfort is not always remembered does not
imply that the patient has not suffered during his or her stay in the ICU.
Reduction in discomfort should remain a focus of attention for both researchers
and clinicians caring for critically ill patients.

Reference list

38-43.


experiences while receiving prolonged mechanical ventilation in an intensive care unit.


Discomfort and factual recollection