

## Distorted Memories of an Intensive Care Unit and Related Factors

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### ABSTRACT

**Background:** Patients discharged from an intensive care unit (ICU) often experience painful ICU memories during recovery. Distorted memories are particularly associated with post ICU mental health disorders. Our study aims were to investigate patients' distorted memory of ICU and related factors.

**Methods:** Twenty-one patients enrolled in this study. The distorted memories were assessed by the ICU memory tool.

**Results:** Distorted memories associated with ICU experiences occurred in 62% of patients. The distorted memories were related to sedation times in ICU and bio-psycho-social vulnerabilities before admission to the hospital.

**Conclusions:** Future studies regarding ICU delirium, distorted memories and patient complexity are necessary.

### Keywords

Intensive care unit, Memories, Delirium, Sedation, Care complexity.

### List of abbreviations

ICU: Intensive care unit; MMSE: Mini-Mental State Examination; ICUMU: ICU Memory Tool; COMPRI: Complexitiy Prediction Instrument; ICDSC: Intensive Care Delirium Screening Checklist; HADS: Hospital Anxiety and Depression Scale; APACHE-II: The Acute Physiology and Chronic Health Evaluation; LOS: Length of stay.

### Background

Patients discharged from an intensive care unit (ICU) often experience painful ICU memories during recovery. It has been reported that there are three types of ICU memories; factual, emotional and delusional memories [1-3]. Factual memories are memories of actual events such as the medical procedures during ICU stay. Emotional memories are memories of feelings such as pain or panic. Delusional memories are non-factual memories

based on hallucinations, delusions, or nightmares. It has been reported that around 30-70% of the patients have delusional memories related to ICU [3-5]. Furthermore, lack of memory of ICU events has also been reported in up to 48% of patients [6-8]. Delusional memory and lack of ICU memory, i.e., distorted memory, are particularly associated with post ICU mental health disorders including post ICU depression, post traumatic stress disorder and so on [3,9-11].

Our study aims were to investigate patents' distorted memory of ICU and related factors.

### Methods

Patients were drawn from consecutive hospital admissions who planed to be admitted in an intensive care unit after surgical procedures at Nippon Medical School Musashikosugi Hospital in Japan. Patients who had cognitive disturbance before surgical procedures assessed by the Mini-Mental State Examination (MMSE) (23 or below) were excluded. The hospital is a 372-bed facility located in Kawasaki city, the 9th most populated city in

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Japan and one of the main cities forming the Greater Tokyo Area. The hospital provides tertiary care to the surrounding community. The ICU is a 6-bed intensive care unit. The ICU memory tool (ICUMT) [12], was administered to the patients 7 days after ICU discharge. The ICUMT consists of 14 items administered by clinical interview. The presence or absence of memory loss or delusional memories was assessed by the ICUMT. The distorted memories were defined as having memory loss or delusional memories.

The following tests were administered to the patients prior to surgery and again seven days after discharge: COMPRI (Complexity Prediction Instrument); ISDSC (Intensive Care Delirium Screening Checklist); HADS (Hospital Anxiety and Depression Scale); and the Mini-Mental State Examination (MMSE). In addition, the APACHE-II was administered at ICU admission only. Age, gender, LOS (Length of Stay), duration of surgical operating time, and durations of sedation and intubation were recorded for each patient.

### **Complexity Prediction Instrument (COMPRI) scores**

The COMPRI [13,14] was assessed at the admission to the hospital. In our hospital, all patients were routinely assessed by the COMPRI at the time of admission. The COMPRI was developed in Europe on the basis of a series of risk factors for care complexity. It consists of 13 questions (3 to the doctor and 3 to the nurse and 7 questions concerning the patient, with yes-or-no answers that can be scored within 5 minutes). The COMPRI scores predict negative patients outcomes such as risk of prolonged length of hospital stay, nursing care complexity, medical complexity, number of consultations and additional nurse-care interventions [13,14]. Our earlier study also indicated that higher COMPRI scores predicted longer length of hospital stay and more deleterious clinical outcomes in a Japanese general hospital [15].

### **Intensive Care Delirium Screening Checklist (ICDSC)**

The ICDSC evaluates the level of consciousness, inattention, disorientation, hallucinations, psychomotor activity, speech or mood disturbance, and fluctuation of symptoms [16]. Delirium assessments were conducted every 8 hours by trained bedside nurses using the ICDSC. According to this instrument, patients were considered to have delirium when at least four of the above mentioned eight items were abnormal. Routine daily delirium screening by the ICDSC was introduced in our ICU from 2013.

### **Mini-Mental State Examination (MMSE)**

The MMSE [17] is a widely used reliable and valid means of assessing generalized cognitive dysfunction as occurs in delirium or dementia, and has been validated in Japanese subjects [18]. MMSE scores range from 0 to 30 where a cutoff score of 23 or below indicates significant cognitive impairment. This scale helped to evaluate convergent validity given that cognition is an important component of delirium.

### **Hospital and Anxiety Depression Scale (HADS)**

Depression and anxiety were screened with the Hospital Anxiety

and Depression Scale (HADS) [19]. It consists of two 7-item self-reported subscales designed to assess current depressive and anxiety symptomatology, respectively. Each item is scored from 0 (not present) to 3 (maximally present), and scores on both the HADS subscores for anxiety (HADS-anxiety) and depression (HADS-depression) range from 0 to 21.

### **The Acute Physiology and Chronic Health Evaluation (APACHE-II) [20]**

To assess the severity of medical illness, the APACHE-II was administered at ICU admission. Higher scores indicate greater severity of acute medical illness.

### **Statistics**

Several analytic procedures were used depending on the nature of the data. For comparison of parametric data in two groups, the Hotelling T square test was used. By using an overall test of significance for the full model, we were able to account for the intercorrelations among scores on the variables and to control for the overall probability of obtaining a significant result by chance (alpha error). This also allowed us to evaluate the mean differences on all variables simultaneously while controlling for the intercorrelations between them. The chi-square test was used to compare categorical data. When sample sizes were prohibitively small, we used Fisher's exact test. All p-values were two-tailed.

### **Results**

Twenty-one patients enrolled in this study. The surgical procedures were the following; 13 cardio vascular surgery (coronary artery bypass grafting n=5, heart valve prosthesis n=7) and 11 digestive surgery (pancreatoduodenectomy n=5, esophageal cancer surgery n=2). Among those, 13 (61.9%) patients had distorted memories (loss of memory n=10, delusional memory n=9, loss of memory and delusional memories n=6). The comparison between the patients with and without distorted memories is shown in Table 1. The Hotelling T square test of the parametric variables showed an overall significant difference between the two groups (Hotelling T square =158.99, p=.047). The patients with distorted memories had higher COMPRI scores and longer sedation times in ICU.

### **Discussion**

This study showed that over 60% of the patients had distorted memories (loss of memory; 47.6% and delusional memory; 42.9%). This finding was consistent with other studies [3-8]. Our results show that the distorted memories were associated with longer sedation times. Samuelson K et al. [5], reported that higher prevalence of delusional memories was found in the heavy sedation patients. It has also been reported that the patients in the deep sedation have more PTSD symptoms, trouble remembering the event, together with more disturbing memories of the ICU than those in the light sedation [21]. A recent review paper indicated that sedation therapy has some influence in relation to the ability to recall ICU events [22]. It should be mentioned, however, that daily sedation interruption protocols have evinced conflicting results regarding recall data in ICU [8,23].

It is interesting that bio-psycho-social vulnerability assessed

	Distorted memory Positive (n=13)	Distorted memory Negative (n=8)	
Sex, male (%)	11 (84.7)	7 (87.5)	p=1.00 (fisher's exact test)
Delirium, n (%)	4 (30.8)	0 (0)	p=.13 (fisher's exact test)
Age, year (SD)	62.8 (7.8)	55.1 (13.3)	F=2.81, p=.11
COMPRI scores (SD)	5.0 (2.6)	2.8 (1.2)	F=5.37, p=.03
Operating time, min (SD)	410.6 (140.5)	308.3 (127.1)	F=2.73, p=.12
ICU LOS, days (SD)	2.5 (1.2)	3.0 (1.1)	F=2.66, p=.12
Duration of Intubation, min (SD)	375.4 (252.1)	225.3 (310.3)	F=2.21, p=.15
Duration of sedation, min (SD)	451.3 (390.4)	145.0 (211.0)	F=5.32, p=.03
APACHE-II scores (SD)	14.1 (3.1)	14.1 (5.0)	F=.01, p=.91
MMSE scores (SD) T1	26.7 (2.9)	26.3 (2.4)	F=.04, p=.84
HADS anxiety scores (SD) T1	7.5 (2.0)	6.8 (1.0)	F=.52, p=.48
HADS depression scores (SD) T1	10.5 (2.6)	9.6 (1.3)	F=.49, p=.49
MMSE scores (SD) T2	26.5 (3.6)	26.1 (3.0)	F=.08, p=.94
HADS anxiety scores (SD) T2	6.5 (2.4)	5.4 (2.1)	F=2.41, p=.44
HADS depression scores (SD) T2	9.8 (2.1)	9.0 (1.4)	F=1.63, p=.47

**Table 1:** The comparison between the patients with and without distorted memories.

SD: standard deviation; T1: Before surgery; T2: Seven days after ICU discharge; COMPRI: Complexity Prediction Instrument; LOS: Length of stay; MMSE Mini-Mental State Examination; APACHE-II The Acute Physiology and Chronic Health Evaluation; HADS: Hospital and Anxiety Depression Scale.

by the COMPRI was a risk factor for distorted memories. Brief bio-psycho-social complexity assessments such as COMPRI, might be added as tools for identifying risk factors for distorted memories; more intensive research using formal bio-psycho-social vulnerability tools such as the INTERMED [24], might also be considered in future studies.

In this study, ICU delirium was not found to be a risk factor for distorted memories. This might be due to a small sample size (Type II error). In fact, all delirious patients assessed by the ICDSC had distorted memories in this study. In other clinical settings, 38 to 74 % of the patients who recovered from a delirium could recall their episodes regarding distress experiences [25-27]. Larger sample sizes may yield more definitive data regarding distorted memories and ICU delirium.

Since distorted memories are related to PTSD or depression, ICU diaries have been developed and implemented to treat the psychological distress of ICU survivors [28-30]. However, in a systematic review [31] evidence to support the use of diaries is inconclusive. Moreover it is possible that patient use of diaries might even be harmful. Actually, in current clinical work, there are recommendations that even compulsory psychological debriefing for preventing PTSD should cease [32]. Further research is required to ascertain whether ICU diaries are safe and effective in practice.

## Conclusions

Our findings indicate that distorted memories associated with ICU experiences occurred in over 60% of patients. The distorted memories were related to sedation times. These data also appeared to involve bio-psycho-social vulnerabilities before admission to the hospital. Future studies regarding ICU delirium, distorted

memories and patient complexity seem axiomatic.

## Declarations

Ethics approval and consent to participate: The Institutional Review Board at Nippon Medical School Musashikosugi Hospital approved this study. Written informed consent was obtained from all participants in this study.

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