INCIDENCE, CAUSES, AND FINANCIAL IMPACT OF DELAY OF TRANSFERS FROM THE INTENSIVE CARE UNIT: A PROSPECTIVE OBSERVATIONAL STUDY

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Abstract

Objectives: Delay of transfers are relatively common in busy intensive care units (ICU) because of many reasons. This study aims to analyse the incidence, causes, and financial impacts of delay of transfer from ICU.

Methods: A prospective observational study was conducted between January and December 2019. All the patients transferred from the ICU were included in the study. Data were collected for patients who were medically fit for transfer but remained in the ICU for one or more extra days. Reasons for delay were noted, extra costs associated were estimated, and the correlation between hospital admissions and overstay in ICU was calculated.

Results: Transfer from ICU was delayed in 6.33% (n = 50) of the 789 patients. Delays ranged from 1 to 7 days (mean 3.84 +/- 1.62). The most common reasons for the delay of transfer were i) unavailability of appropriate isolation beds (48%), ii) unavailability of bed in the wards (24%), iii) unavailability of suitable beds in the peripheral hospitals (24%), and iv) social or administrative reasons (4%). A positive correlation was found between the monthly hospital census and the ICU bed occupancy (Spearman rho = 0.87, p=0.041). Extra costs associated with delays of transfers were OMR 28800 (USD 74902) during the entire study period, translating a per patient excessive cost of OMR 576 (USD 1498).

Conclusions: Delay of transfer from ICU is common and incurs an unnecessary healthcare expenditure. A high hospital admission rate is associated with a delay in transfer of ICU patients to the wards.

Keywords: intensive care unit; patient transfer; patient isolation; beds; financial

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Introduction

Treatment in intensive care unit (ICU) is uniformly expensive all over the world[1,2]. As such, administrative and clinical efforts are focused to contain expenditures in order to use these precious resources wisely. Delayed discharges from ICU pose significant constraints on optimising hospital resources and results in financial and administrative burdens to the hospital. We conducted a prospective observational study to quantify the incidence and identify the causes responsible for delay of transfers from our ICU. We also attempted to find any association between hospital census with ICU overstay and the financial impact for each day of delay of transfers from ICU. To the best of our knowledge, this is the first study from the Sultanate of Oman addressing the extent of delay of transfers from ICU in a tertiary care hospital, its financial implications and the possible remedies towards a better healthcare utilisation and equitable distribution of resources.

Methods

The study took place in a 30 bedded ICU of Khoula Hospital, a tertiary care teaching hospital in Muscat, Sultanate of Oman. After obtaining approval from the research and ethics committee, a prospective observational study was conducted between January and December 2019 in our ICU. Individual informed consents were not required and there was no deviation in terms of intensive care management of these patients.

All patients admitted to the ICU between January and December 2019 were included in the study. Patients who died during this period in the ICU, those who left ICU against medical advice and patients transferred to hospitals abroad for further treatment were excluded as they did qualify for ICU overstay. Data were collected for patients who were medically ready for transfer to the wards but remained in the ICU for one or more extra days for any reason other than medical. We recorded the reasons for each delay of transfer and calculated extra costs associated with the delay. We also calculated the correlation between hospital admissions and ICU overstay.

Our ICU runs on a semi-closed model where intensive care consultants and specialists are primarily responsible for patient care. The decision to transfer a patient to the wards or peripheral hospitals (from where the patient was referred to our tertiary care centre) was based on ICU discharge criteria and a broad consensus amongst consultant intensivist, the primary team consultant, and the ICU nurse in charge.

Data was collected about ICU transfers and delays of transfers from the ICU admissions and discharge register. The reasons causing delay of transfers from ICU for each patient were identified. On-call intensive care specialist collected and updated the register everyday midnight whenever any discharged patient was not transferred out of ICU to the respective destination due to any non-medical reason. The total duration of extra ICU stay, decision time of discharge from ICU, the actual date and time of transfer from ICU, cause of delay in transfer and additional expenses due to ICU overstay were obtained.

Data analysis:

Data obtained from the study was analysed for each quarter of the study period. Data were expressed as numbers, percentage, and mean +/- SD. Spearman's correlation coefficient was calculated to determine a relationship between hospital admissions and higher ICU bed occupancy. A p-value <0.05 was considered as statistically significant. SPSS 25 (IBM SPSS Statistics, IBM Corporation) was used for data analysis.

Results

Altogether 869 patients were admitted to our ICU (3.7% of all hospital admissions) between January and December 2019. During this period, 789 patients were transferred after treatment in ICU to different hospital wards or peripheral hospitals. Delays of transfers from ICU were recorded in 6.33% (n = 50) of the transfers (Table 1). A seasonal trend in ICU overstay was observed during the study period. The first quarter of the year had the maximum number of delay of transfers, whereas the second and last quarter of the year had the least (Table 1). Delay of transfer from the ICU ranged from 1 to 7 days (3.84 ± 1.62 days). The most common reasons for delay of transfers in

Table 1
Intensive Care Unit admissions, discharges and transfer delays

Quarter	Total hospital admissions, n	Total ICU admissions, n (%)	Total transfers from the ICU, n	Total transfers for treatment outside/ LAMA, n	Total ICU deaths, n	Delay of transfer from ICU in days, (mean +/- SD)	Number of patients with delays, n (%)
Jan-Mar	6,074	210 (3.45)	187	4	19	4.22 +/-1.77	22 (11.76%)
Apr-Jun	5,580	208 (3.72)	195	2	11	3.75 +/- 1.83	08 (4.1%)
Jul-Sep	5,839	217 (3.71)	196	7	14	3.5 +/- 1.16	12 (6.12%)
Oct-Dec	5,966	234 (3.92)	211	6	17	3.87 +/-1.8	08 (3.79%)
Total	23,459	869 (3.7)	789	19	61	3.84 +/- 1.62	50 (6.33%)

*LAMA: left hospital against medical advice

our ICU were 1) unavailability of appropriate isolation beds/rooms in the wards, 2) unavailability of beds in the wards, 3) unavailability of suitable beds in the peripheral hospitals, and 4) social or administrative reasons (Table 2). There was a positive correlation between hospital census (admitted in-patients) and ICU bed occupancy (Spearman rho; r=0.31, p=0.041). The average extra cost associated with each day of ICU overstay was estimated to be 576 Omani Rial equivalent to USD 1,498 (Table 2).

Table 2
Incidence, causes, and financial impact of delay of transfer from the Intensive Care Unit

Common reasons for ICU overstay, n (%)	1. Unavailability of isolation beds in wards: 24 (48.0%) 2. Unavailability of beds in wards: 12 (24.0%) 3. Unavailability of suitable beds in peripheral hospitals: 12 (24.0%) 4. Social/administrative reasons: 2 (4.0%)
Cost associated with ICU overstay (in OMR and USD)	Over entire study period: OMR 28,800, USD: 74,902 Average extra cost per overstay: OMR: 576, USD: 1,498
Hospital census (correlation between hospital admissions versus ICU occupancy)	Spearman Rho=0.98, p=0.041

* OMR=Omani Rial, USD=United States Dollar (1OMR=2.6USD)

Discussion

The present study revealed an average delay of transfer of 3.84 days among eligible patients (ready for discharge) in 6.33% of the ICU transfers in Khoula Hospital. Unavailability of isolation beds/rooms (appropriate for patients requiring infectious contact precautions) in the wards was the principal reason accounting for almost half of the delays. The delay in timely transfers resulted in a combined loss of OMR 28,800 (USD 74,902) during the study period.

An Australian study in 2004 found that 27% of ICU transfers were delayed (median delay time was 21.3 hours; range, 10 minutes to 26 days)[3]. Unavailable ward beds (81%) were the main reason for the delay in discharge[3]. Edenharter G et al. reported delayed transfer from the ICU to the wards in 24.8% of the transfers. Lack of appropriate bed in the ward was responsible for 91.7% of those delays. In their study, the internal cost calculation showed 1 min of delay corresponds to 0.75 Euro (1,080 Euro/day), which led to a total cost of Euros 199,268 (~ USD240,000) for the study period[4]. Ofoma and colleagues explored the associations between hospital occupancy, ICU transfer delay and hospital mortality. They showed that a hospital occupancy level above 80% was associated with longer transfer delays, which might be

associated with increased hospital mortality[5]. Johnson and colleagues conducted a prospective observational study on incidence, causes, and financial impact of delay of transfer from the intensive care unit[6]. Their study showed transfer from surgical ICU to the floor was delayed in 22% of patients with delay ranged from 1 to 6 days (mean 1.5 days). The extra costs associated with delays were estimated to be USD 21,547/week (USD 3,078/day). The two most common reasons for the ICU overstay were lack of available surgical-floor bed (71%) and lack of isolation bed/room (18%)[6]. Similar to the findings of Ofoma et al.[5], Johnson DW and colleagues also showed an association between the daily hospital census and the daily number of Surgical ICU beds occupied by patients delayed in transfer[6].

We had multiple compelling reasons for delays in the timely transfer of patients from our ICU. First, our hospital is a tertiary referral centre catering to the entire country for neurosurgical, spine and neurological complex cases; therefore, availability of beds in wards and particularly beds appropriate for patients requiring contact precautions for their infections (isolation room/ beds in the wards) is a perpetual problem. Together they accounted for 72% of the delay of transfers. Second, the logistics of transfer to a peripheral hospital (i.e., availability of beds in peripheral hospitals, transfer arrangements within a reasonable time frame within the day) once their management in our centre is over was also an important reason responsible for delay in 24% of the transfers, and third, social and administrative issues, although small but could delay 4% of the transfers.

As per the hospital protocol and established guidelines, patients infected or colonised with multidrug-resistant organisms or Clostridium difficile must have single rooms or share a room with patients infected with the same organism[7]. In Khoula Hospital isolation beds (single room or in the wards) outside ICU were minimal. Therefore, in our study, the main reason for the delay of transfer from ICU unavailability of isolation beds/room. Evidence in published studies is divided regarding the efficacy of contact precautions; however, it is still recommended to keep infected patients isolated. The trend is unlikely to change soon[8,9]. The main reasons for unavailability of floor beds were delay in transferring ready to discharge patients from the wards to home, delay in decision-making by the admitting physician, hesitation of the ward nurses about optimum care of tracheostomised patients, and at times administrative reasons resulted delayed transfer. Being a tertiary care national centre for trauma, spine, and neurological diseases Khoula Hospital encounters tremendous constraints regarding availability and turnover of in-patient beds in the wards. We do not have a high dependency unit or surgical step-down unit in the hospital, which compounded the bed availability problem by many folds. Delay of transfer due to beds unavailability in peripheral (referring) hospitals is a unique finding in our study. The reason behind this is multifactorial: scarcity of specialised workforce (trained doctors and nurses) in smaller peripheral hospitals situated in different corners of the country, low bed turnover, and inadequate infrastructure for follow-up of complex cases in such hospitals are some of the factors that caused a delay in 24% of the transfers. At times, lack of communication and shared decision-making with patients' relatives or next of kin resulted in poor compliance (on their part) while we were planning a transfer to a peripheral hospital, which resulted in a delay in 4% of the transfers. Despite all these contributing causes described above the present study showed that the delay of transfer from our ICU (6.33% of total transfers) is comparable or better than many of the published studies[3-6].

Delays of transferring from ICU have considerable financial burden on the healthcare system. ICU care is expensive globally because of staffing pattern (doctor to patient and nurse to patient ratio), expensive equipment, infrastructure, and consumables. Therefore, the duration of ICU overstays disproportionately increases the overall costs compared to ward-based care. It also prevents judicious utilisation of precious ICU resources by obstructing ICU admission of some of the sickest but salvageable patients; the impact of which can not be computed in terms of money. In a recently published study (2020), Bagshaw and colleagues showed that 6.4% of total ICU cost is attributable to the avoidable time patients spent in the ICU[10]. Our internal cost analysis which revealed an increased cost of OMR 28,800 (USD 74,902) associated with delay of transfers over the entire study period or OMR 576 (USD 1,498) for each day of ICU overstay. Published studies have shown similar estimates for each day of

ICU overstay[4,6,10].

Our study had some limitations. It was a single centre study in a tertiary care surgical ICU. Available staffing in the hospital wards and peripheral hospitals might have affected the outcome. We did not analyse the reasons behind seasonal trends in the delay of transfers. We estimated the average cost; however, it is not uniform over the period. In a study, Dasta and colleagues demonstrated the higher expenses during the initial two days of ICU care[11]. We counted the time of delays in days, but it could have been more realistic to count in hours. Our cost estimates expenses are accurate only for hospitals governed by the Ministry of Health, Sultanate of Oman, and may not be applicable for private hospitals.

The present study brought some remarkable changes. Creation of more isolation bed for patients requiring contact precautions, revamping day-care surgery, timely discharge of patients from wards, training of bedside nurses to recognise ready to discharge patients, educating junior doctors regarding the discharge process, and better liaison with peripheral hospitals: are some of the direct impacts.

Conclusion

Delay in discharge from the ICU is common in every hospital, increasing the hospital expenses and quality of healthcare. Timely intervention and proper planning could help to reduce the delay. Healthcare workforce should be trained to identify the cause and mitigate the issue.

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Conflicts of interest: None

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