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ORIGINAL ARTICLE

Introduction of an ITU Outreach and Follow-up Service at Mater Dei Hospital

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Background

Background: Recently, critical illness is seen more as a continuum of care across the whole hospital stay rather than focussed solely on the ITU admission. Hospital services such as Outreach Teams, Transition Programs and Follow-up Clinics have been introduced worldwide. They focus on specific aspects of patient care such as early recognition of critical illness and rehabilitation goals. The latter is dealing mostly with the Post Intensive Care syndrome (PICS), a hereditary and complex state related specifically to ITU survivors. Mater Dei Hospital has recently launched an ITU Outreach and Follow-up Service. We analysed their data collected over one year.

Methods

A mobile phone application "ITU Flow" was designed on a Microsoft@ Power Platform. We collected data related to the referral and discharge process. The application works as an essential auditing and communication tool of the service.

Results

Patients followed-up were mostly surgical or those suffering from respiratory failure and required only one review by the ITU team. Most issues dealt with were related to the chest, weakness or drug prescription and stayed long term. The Emergency Department made most referrals concerning patients with respiratory and/or cardiovascular failure. Almost 40% of patients were immediately admitted to ITU and in one fifth of cases significant changes to patient care had to be made. Only 12% were deemed unsuitable for ITU, a very small number was admitted at a later stage.

Conclusion

ITU survivors appear to suffer from PICS at least in the short term, and possibly in the long term as well, as demonstrated by repeated visits after ITU discharge. This warrants individualised and interdisciplinary care. An ITU follow-up clinic in an Outpatient setting should be considered. Pre-selection of patients is essential to run the service cost efficient. Most ITU referrals lead to an admission or to major changes to the treatment plan. The Outreach Team thus contributes significantly to patient care outside ITU or assists in immediate transfer if necessary.

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In recent years, critical illness is seen more and more as a continuum of care expanding far beyond the actual stay at the Intensive Care Unit with several distinct stages. The journey starts with transfer of the critically ill patient to the Intensive Care Unit, followed by a timely discharge to an HDU/monitored bed or a ward setting, later to a rehabilitation centre and then finally home.[1,2]

At any time along the process towards discharge from hospital, the patient is at risk of deterioration and possible subsequent readmission to ITU, with mostly unfavourable outcomes.[3] Mortality and morbidity in patients readmitted to ITU is high [4,5] and several studies have shown that critical illness affects a patient's health and well-being long-term, and far beyond the acute event itself.[6,7] Some survivors' quality of life, in fact, remaining below average for up to five years.[8]

The complex health issues affecting ITU survivors, which comprise cognitive, psychiatric and/or physical disability, have been summarized under the term PICS (Post Intensive Care Syndrome).[9-11] Furthermore, the early recognition of the deteriorating patient and the smooth transition from a high dependency setting to the ward are crucial moments for a favourable patient outcome.

Internationally, several models exist detailing how to ease the communication between the different entities of patient care including Rapid Response Teams[12], ITU Outreach Teams[13] and liaison nurses.[14] Such teams may be led by physicians, nurses or a combination of the two.

Mater Dei Hospital has recently introduced an ITU Outreach and Follow-up Service led by senior members of the ITU team with the following tasks:

1. identifying the deteriorating patient early;
2. starting adequate emergency care in the ward;
3. facilitating transfer to a clinical area offering higher level of care;
4. facilitating the transition of care from ITU by performing reviews in the wards within 24 to 48hrs after the patient has been discharged; and
5. identifying early those patients who show signs of PICS related issues, with the intention to prevent disease progression and to highlight specific needs for future rehabilitation.

To support this service, members of the ITU team developed an in-house mobile app called ITU Flow. This was designed to ease communication between team members as well as to audit the service.

This paper demonstrates the results and observations made over one year after the introduction of the service and gives an outlook on future improvements and initiatives.

METHODS

The mobile phone application "ITU Flow" used by the Outreach Team was designed on a Microsoft® Power Platform (Microsoft® Corporation, US), using Power Apps as the interface and Sharepoint Lists as a database. This platform is hosted on MITA servers, which ensures GDPR-compliancy and also improves security.

The application consists of two separate components, one dedicated to new referrals to ITU and the other dedicated to patients discharged from ITU.

Once a patient is referred to ITU, a member of the ITU team will use the ITU Flow application to collect the following data: patient demographics, the ward the patient is currently in, date and time of referral, the referring specialty, acute organ failures detected on initial assessment, whether a previous review had been performed, and the decisions taken by the team. The data is then stored in a secure Sharepoint list and available for future reference.

When a patient is discharged from ITU, an ITU discharge letter is prepared using the same app and uploaded on iSoft. This also collects the following data: patient demographics, discharge date, future ward, diagnosis on discharge and whether any specific concerns exist that the team should be focusing on during their ward reviews.

In a meeting of all ITU consultants a list of frequently encountered issues related to an ITU stay was agreed upon and included in the app as a drop-down menu. The items are all related to PICS, either directly or indirectly. We specifically assess the patients on the following: weakness, renal function, nutrition, analgesia, microbiology/antibiotics, swallowing, medication, chest/breathing, vascular access, delirium/PTSD, tracheostomy care and deranged blood tests. A textbox allows further notes to be added as needed. After the patient review, a decision is made on whether the patient requires further visits or if they can be discharged from the follow-up program. The ITU Outreach doctor also alerts non-

medical and AHP staff such as physiotherapists, speech language therapists or dieticians if needed.

The application is used by the Outreach Team to track the referrals who have not been admitted to ITU and the patients discharged from ITU who still require some follow-up.

In this way, it serves as a communication tool between members of the Outreach Team, allowing an easy form of documentation.

Ethics approval was granted by the University Research Ethics Committee of the University of Malta.

Statistics

Data was exported from Sharepoint Lists to Excel® (Microsoft, California, US). This was analysed using RStudio (RStudio: Integrated Development Environment for R, Version 2023.06.1+524, Boston, Massachusetts, USA), with R version 4.0.3 (The R Foundation for Statistical Computing, Vienna, Austria). All data was first tested for normality using visual methods and with Shapiro-Wilk's normality test. Where appropriate, parametric tests were used, but most data showed high levels of skewness. In such cases, median and IQR are reported, and non-parametric tests were used for analysis.

RESULTS

Referrals

From March 2022 to March 2023 a total of 778 patients were directly referred to the ITU Outreach Team. The mean age of all referrals was 61 years (IQR: 49-76), with the age distribution being shown in **Digital Supplemental Figure 1**. Most referrals were made by the Emergency Department (29%), followed by the Medical Wards (16%) and admissions from Emergency Theatres (9%), as shown in **Digital Supplemental Figure 2**. The majority of patients suffered from respiratory or cardiovascular failure followed by renal failure and haematological disturbances (**Digital Supplemental Figure 3**).

While 38% of patients were admitted straight to ITU after the first review, 6.4% were seen twice or more before a decision to admit was taken (**Figure 1**). In 21% of cases no changes to the current treatment plan had to be made. Almost 12% of all referred patients were not ITU candidates while 20% needed advanced organ support, notably respiratory support in other enhanced care areas (CCU, SHDU and MAUs).

Between March 2022 and March 2023, a total of 731 patients were followed up on after discharge from

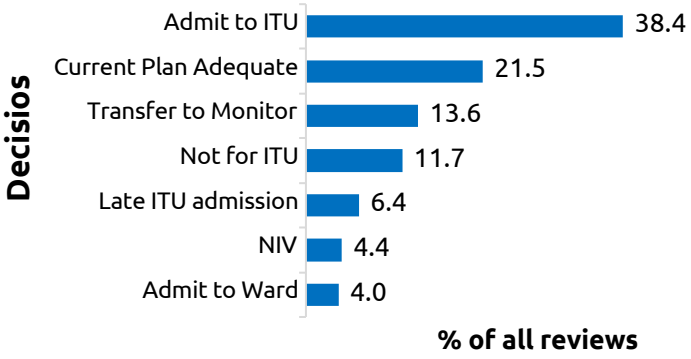

Figure 1 *Decisions taken by the Outreach Team after patient review*

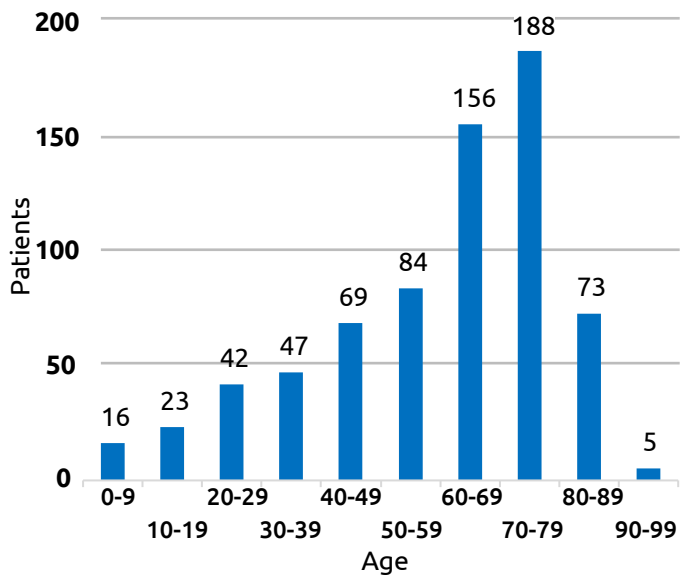

Figure 2 *Age Distribution Discharged Patients*

the Intensive Care Unit. The median age was 64.0 years (IQR: 47.0 – 74.0), with the youngest patient being three years old and the oldest 94 years old (**Figure 2**). Most patients were admitted after emergency or elective general surgery (134 patients, 18.3%), with Type 1 Respiratory failure (71 patients, 9.7%) being the second most common reason for ITU admission (**Figure 3**). Neuropsychiatric emergency such as overdoses and delirious states are the third most common diagnosis (53 patients, 7.2%). Urosepsis is listed separately from other bloodstream infections as it was the most common cause of sepsis (23 patients, 52%). COVID related admissions accounted for only 2.3% of all admissions (17 patients).

The wards receiving the majority of patients after discharge were the surgical wards (Surgical, HDU, NSW, Orthopaedics, ENT, Urology, Plastics, CSW) with 49% of all transfers, followed closely by the medical

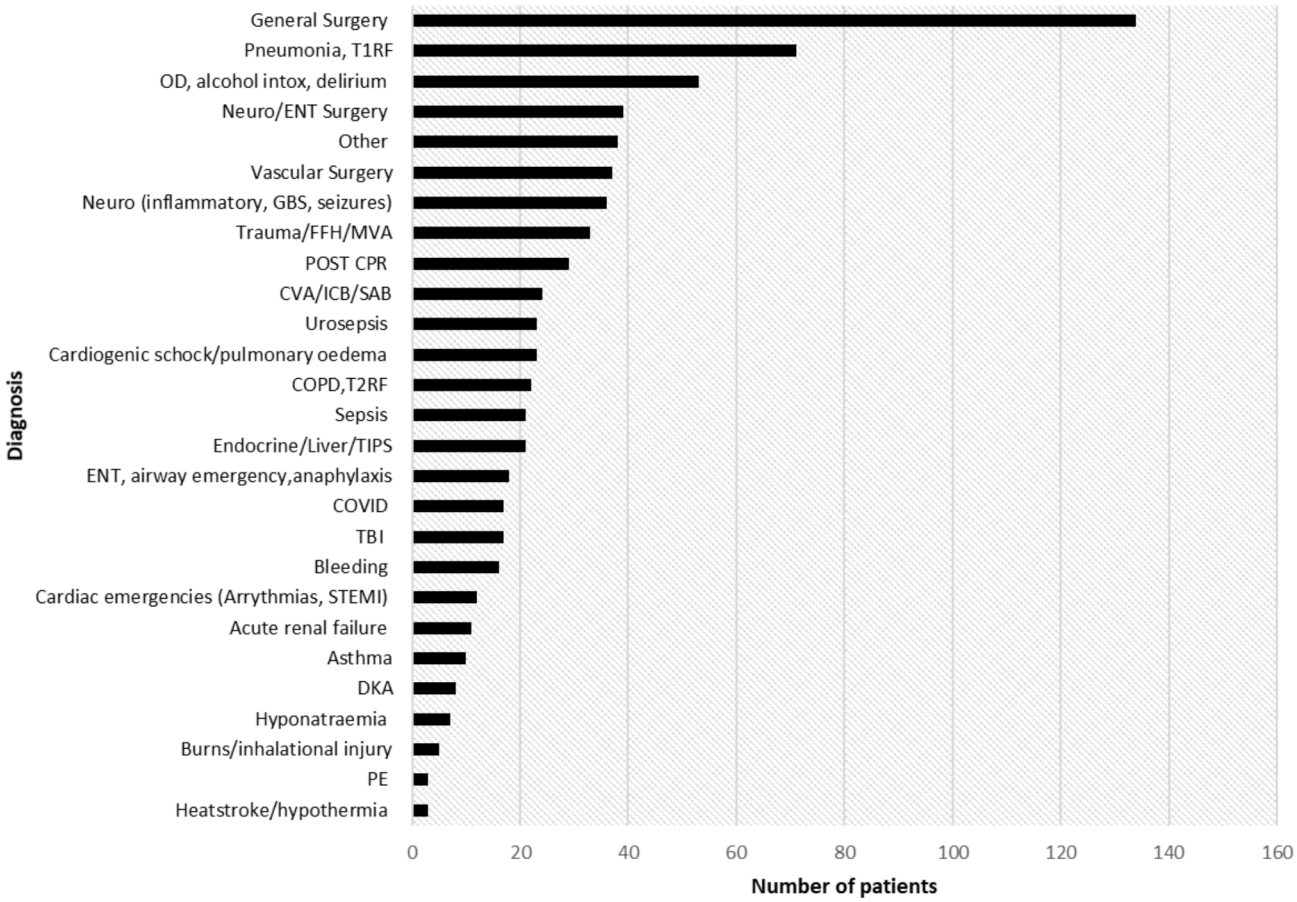

Figure 3 *Distribution of medical diagnosis across the sample population*

wards (Medical, MAU, NMW, CMW) with 31%. 9.6 % of all patients were transferred to a surgical higher dependency unit, as shown in Figure 4.

The ITU Outreach Team performed a total of 1,057 post-discharge reviews, with most patients required only one review. However, 10.6 % of patients required a minimum of 3 and 3.5% needed 4 or more visits (Figure 5).

The majority of patients demonstrated none or only one ITU related issue during the follow-up visits. A total of 14% had 3 or more areas of concern being brought to attention by the team (Digital Supplemental Figure 4).

The most common concern to the follow-up team were issues related to the chest (42.3 %) and overall muscle weakness (12.6 %). Issues related to the prescription of medication (antibiotics, analgesia, sedatives and psychotropic medication) were also common (Digital Supplemental Figure 5).

When comparing the trajectory of the concerns upon discharge, the data shows that most problem areas persisted (Figure 6). This is particularly true for the

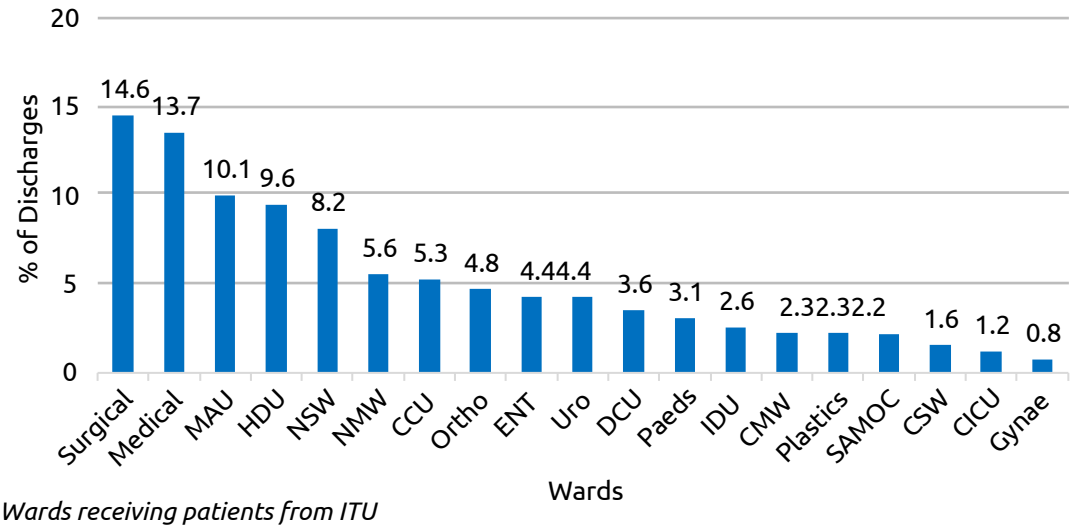

Figure 4 *Wards receiving patients from ITU*

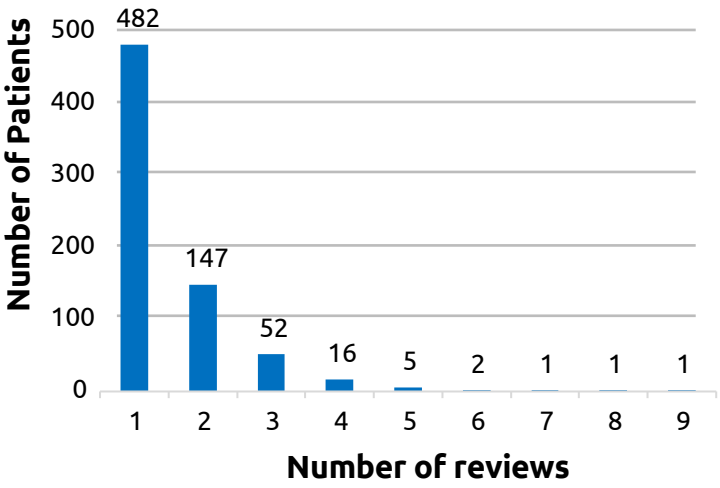

Figure 5 *Number of ward reviews per patient after discharge from ITU*

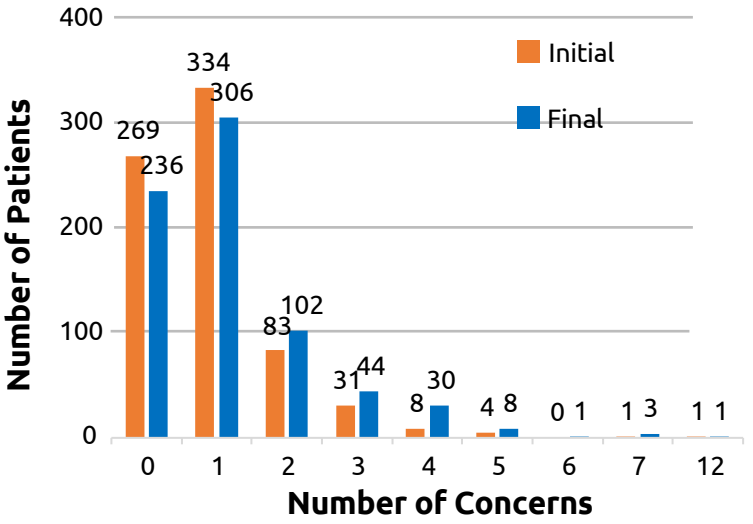

Figure 6 *Comparison number of concerns between first and last visit*

most frequently encountered issues: chest, kidney injuries and muscle weakness (Figure 7). Indeed, follow-up identified new concerns during subsequent visits.

DISCUSSION

Over the last few years, the Intensive Care Community started to broaden their clinical interest from the patient's stay inside the Intensive Care Unit to the period before and after, shaping the concept of ITU without borders or Critical Care Transition Programs. [15-17] During the time before admission, the focus is mostly on the early recognition of the deteriorating patient and the quick initiation of appropriate care resulting in the worldwide introduction of Medical Emergency Teams (MET) or Rapid Response Teams (RRT). Their overall effect on patients' outcomes are mixed, however there is evidence that they can improve the survival rates of in-hospital CPRs, assist with end of life decisions and help to decrease the number of unplanned ITU admissions [18,19,20]. Care after ITU focuses on the various rehabilitation needs of this particular patient group summarised under the term "Post Intensive Care Syndrome" (PICS) (21). The Post Intensive Care Syndrome is a complex state comprising several sequelae such as: weakness, PTSD, malnourishment and chronic pain lasting often for many months sometimes up to years after critical illness.[22,23] The intense rehabilitation needs of ITU survivors have been addressed as early as 2009 by the National Institute for Health and Care Excellence (NICE).[24] It is

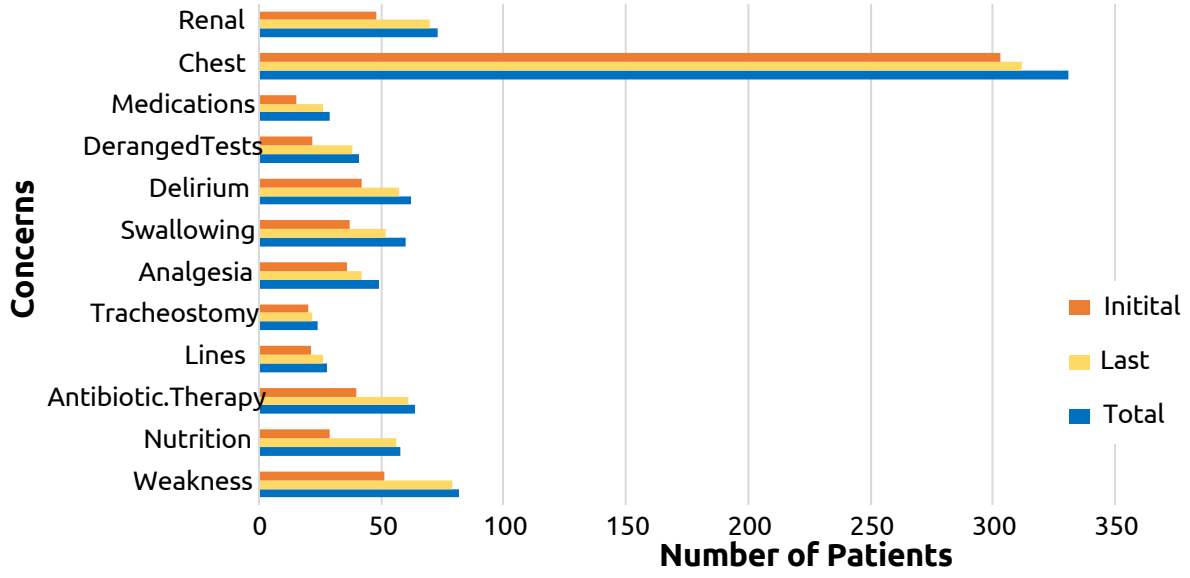

Figure 7 *Detailed list of specific concerns on the first and last visit of followup*

recommended to identify patients suffering from PICS early and to plan a rehabilitation pathway before discharge from hospital. ITU Follow up services have since then been introduced in several countries [25-27] despite mixed results on their effects on patient outcome. The lack of evidence has been attributed to their heterogeneous nature [28,29] and lack of randomised controlled trials.

We recently introduced an Outreach and Follow-up Service at Mater Dei Hospital, and we wished to assess the impact of this service on the clinical course of ITU patients out of ITU.

ITU Outreach

Over one year 778 patients were directly referred to the Outreach Team. This data does not include elective post-op referrals or CPRs and underestimates the true number, as input of the data is dependent on the individual performing the review. The team received most referrals from the Emergency Department concerning respiratory and circulatory failure. The team admitted the majority of patients after the first review (38%) but also referred nearly 15% to enhanced care wards – wards offering NIV and monitored beds.[34] The escalation of care was thus in most cases warranted. In 20% of the cases, the role of the Outreach Team was an advisory one and no major changes to the current treatment plan or patient location had to be made. Notably, in only 6% of cases the patients needed ITU admission at a later stage. It is difficult to interpret this number without further details but it could mean that in the majority of cases the solutions offered by the Outreach Team were sufficient. 11% of cases were not suitable ITU candidates. Even this number is hard to interpret without further details on the specific case but it could mean that the Outreach Team did contribute to ceilings of care and end of life decisions.

Follow-up Program

Over one year, the ITU team followed up on 761 patients after discharge from the Intensive Care Unit resulting in 1,867 reviews. Our data shows that most patients were admitted to ITU post operatively. Accordingly, most of our reviews were done in surgical wards. On average, surgical patients do not stay long in our ITU and it is not surprising that most of the patients only required one post discharge visit. The second most frequent diagnosis was Type-2 Respiratory failure, which explains how one of the main concerns during the ward visits were related to the chest. This entailed a high secretion load, a new chest infection or concerns raised by the physiotherapists regarding cough strength. Interestingly, a total of 14% of patients worried the team enough to expand their follow-up care to more than 3 visits. Preselection of the patients is thus crucial to remain cost effective, to address staff shortage and focus efforts on those in need; an important observation made by other Follow-up Teams in the past.[30] The amount of concerns per patient dealt with by the intensivists supports this conclusion. Most patients had none or only one area of concern to address taking into consideration that the team primarily assessed issues related to the previous ITU stay to avoid interference with general ward management. Our results with regards to frequency of PICS related sequelae is reflected in current literature. Motor deficits, decreased lung function and delirium are common in ICU survivors.[31] Most of these deficits remained even after the team made a decision to stop regular ward visits. PICS is a long-term condition and can persist even for months after discharge. We did not review the patients after discharge from hospital but seeing that a high percentage still had respiratory issues and muscle weakness on our last visit raises the question for the need of an ITU Follow up clinic at Mater Dei Hospital. Furthermore, one of the functions of the team could be to raise awareness and help to further strengthen the relationship between doctors and allied health professionals such as physiotherapists, nutritionists and occupational therapists. Literature shows that transitional services can help ease anxiety of patients and families during the transition period from higher levels of care to peripheral wards and can also help prevent miscommunication during handover.[32,33]

Since the service was introduced, the ITU started using an electronic discharge summary that is accessible on the same application (ITU Flow) and also uploaded on iSoft. The document provides the ITU Outreach doctor with enough information to make decisions during the visit without reading through the ITU stay notes and assists in a smoother flow of information on discharge.

Limitations

This was a single centre study and the results might therefore not all be transferrable to another institution. Furthermore, we did not assess PICS related symptoms with established questionnaires. A future project would involve a similar study design with added questionnaires for the more common PICS related sequelae such as the HADS and DSM-5 for quantifiable data on anxiety, depression or PTSD related symptoms. As some of these disorders of mental health can develop at a later stage or in the case of PTSD per definition begin months after the

traumatic event, some tests would have to be run at a Follow-Up Clinic after patient discharge from hospital.

CONCLUSIONS

Mater Dei Hospital has been successfully running an ITU Outreach and Follow up service since 2021. This is the first data analysis collected over one year (March 2022- March 2023). The data shows, that our ITU survivors suffer from long term sequelae, which warrant individualised plans for rehabilitation and interdisciplinary care. A future long-term follow-up in form of an Outpatient Clinic should be considered. Preselection of patients in need of further ITU input is essential to run the service in a time and cost-effective manner. A post ITU visit can raise awareness to the specific needs this particular group of patient has and promote interdisciplinary communication. In the future data collection will focus more on quantifiable data to assess symptoms like weakness or PTSD with questionnaires or activity measures like grip strength and 6-minute walk tests. The Outreach Team helped to facilitate the transfer of critically ill patients to the Intensive Care Unit and also assisted in making significant changes to the treatment plan outside ITU. Over the past year the mobile application has undergone several updates and in the future the Outreach Team will collect data on the severity scores of ITU referrals with the aim to assist hospital plans to expand enhanced care wards and to improve communication between the wards, the Emergency Department and the Intensive Care Unit.

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