

An evaluation of the conservative management of fractures with plaster in a Maltese primary health centre

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ABSTRACT

Introduction

Fracture management still remains a grey area in primary care internationally. In Malta, conservative fracture management operates as the Plaster Slab Service, a service which has never been evaluated. The purpose of this study is to assess this service in Mosta Health Centre (MHC) – the only health centre with a 24/7 X-ray service. The objective is to find common trends and to increase primary care awareness on conservative fracture management.

Method

In this cross-sectional study, all patients who had a plaster cast done at MHC between August and December 2017 were included. Retrospective data was collected including demographic data (age, gender, locality), time of application, type of injury and plaster, problems related to the slab and wound healing as well as whether a repeat X-ray was taken.

Results

Most plaster casts were required for the younger age group with another peak in the 60s-70s age group. Younger patients showed a significantly increased risk of sustaining a scaphoid or radial fracture. There was a significant link between patients' locality and time of presentation. Only 44.6% of scaphoid fractures had a repeat X-ray done as follow up. Complications to fracture healing amounted to 1% whilst 5% had problems with the cast.

Conclusion

At primary care level, a wide range of fractures can be successfully managed with a very low rate of complications. Possible areas for improvement include guideline adherence in the follow-up of fractures.

Keywords: plaster casts; primary care; bone fractures.

INTRODUCTION

Background

Acute musculoskeletal injuries, including fractures, are a common presentation in general practice. Multiple studies so far have shown that family doctors can manage a wide range of fractures, with healing times comparable to standard orthopaedic care (Eiff and Saultz, 1993).

Despite this, fracture management still remains a grey area for many doctors. A survey revealed that the majority of general practitioners (GPs) believed they needed more training in this area (Eiff and Saultz, 1993). Nowadays orthopaedics and fracture care are part of the general practice (GP) specialty training curriculum in Malta. Nevertheless, fracture care varies between practices and this is dependent on multiple factors including accessibility to plain radiography, specialist consultation, experience and training (Eiff and Hatch, 2012). Multiple studies have concluded that fracture outcome in family practice is positive while as stated in a 1994 study, most complications can be avoided if GPs learn to select which fractures to treat in primary care (Hatch and Rosenbaum, 1994).

In Malta, the conservative management of fractures with plaster is a service that functions within primary health care as the Plaster Slab Service. X-ray imaging is available on site in the three main government health centres (Mosta, Floriana and Paola) and plastering of fractures is offered by the nursing services of each centre. Plasters done at the health centres include a scaphoid slab, a dorsal or volar below-elbow slab and a below-knee back slab. Mosta Health Centre (MHC) is the only health centre running a 24/7 imaging service within the government premises and thus plaster application is available at any time required. Images obtained are viewed via an online software IT service which shows up the images taken instantaneously. This software is also available for viewing by radiologists and orthopaedic specialists at the sole general hospital, Mater Dei Hospital. Whenever there is uncertainty or clarification is required by a family doctor viewing the X-ray, the radiologist on call can be consulted for an official report. In addition the orthopaedic specialist on call at the hospital is also available. The latter is usually contacted for advice regarding management of fractures and future appointments at the Fresh Trauma Clinic (FTC), a clinic offered at orthopaedic outpatients in hospital.

A study conducted in MHC to assess the GP consultations showed that musculoskeletal complaints were the commonest reason for consulting (Cuschieri and Sammut, 2013). Other national and international similar studies showed musculoskeletal-related problems as one of the 5 commonest complaints to a GP (Baldacchino

et al., 2017; Cuschieri and Sammut, 2013; Soler et al., 2011). Research on the conservative management and follow up of fractures in primary care is lacking (Eiff and Saultz, 1993). Local services are readily available as described above. However, to the authors' knowledge, no evaluation of these services has yet been conducted.

Aim

The purpose of this study was to evaluate the plaster slab service at MHC, assessing patients' demographics, the different fractures that present, plaster casts done and complications that arise from the plaster and fractures. The objective was to provide an overview of the use of these services available locally, to be able to compare to similar services in other practices. In addition, the intention was to increase awareness on the importance of managing fractures conservatively in primary care.

METHOD

The study carried out was descriptive, retrospective and cross-sectional. All patients who had a plaster cast done at MHC between 1st August and 31st December 2017 were included in this study. This evaluation was approved by the Department of Primary HealthCare and by the Data Protection Officer of the Department.

Data input was done using Microsoft Excel and collection of data was done retrospectively using two sources:

1. The Requisition for a Plaster Slab sheet available and filled in for each patient requiring a plaster slab

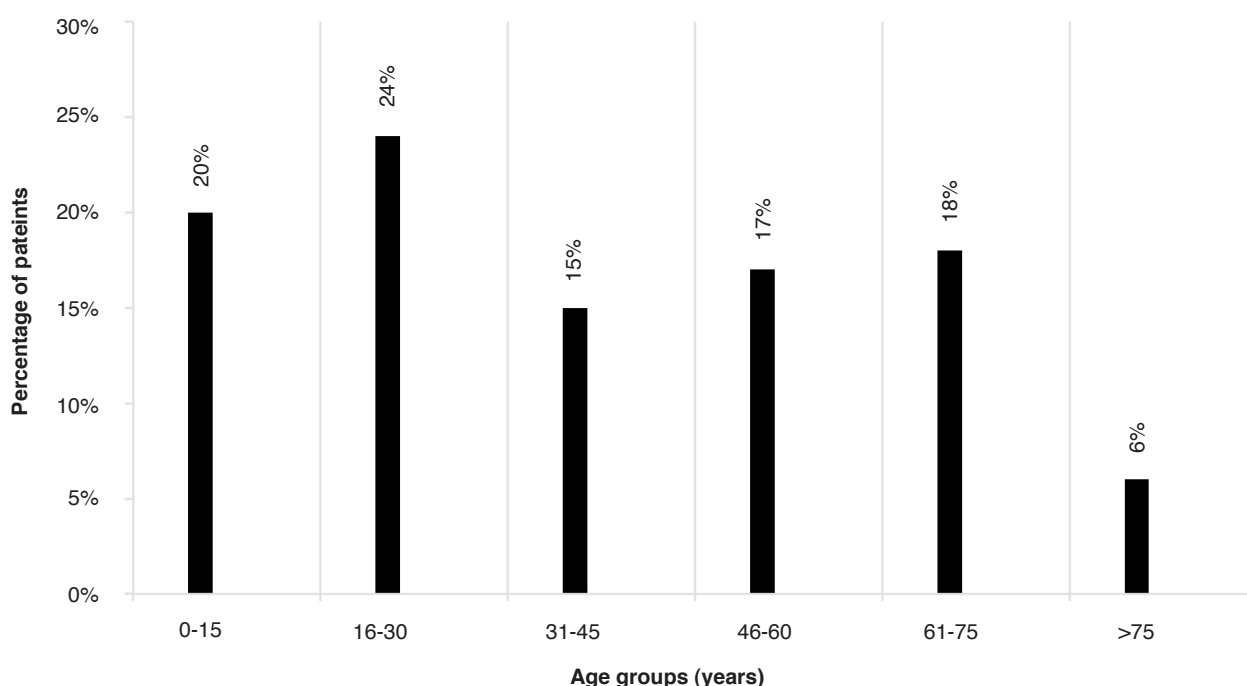


Figure 1: Prevalence of plaster casts required across the different age groups

at MHC. Information acquired included date and time of application of plaster, type of injury/fracture, type of plaster done and problems with the slab that required re-application. From the same sheet it was also noted whether the nurse and doctor signatures were present confirming whether plaster was checked once applied. Time was divided as per doctors' working shifts to give an overview of the changes in workloads as well.

- The iSoft Clinical Manager was used to obtain demographic information on patients' age, gender and locality as well as information related to imaging such as whether a repeat X-ray was done and whether complications of wound healing arose. Age was subdivided into different age groups at 15-year intervals. This allowed specific age groups to emerge including children, young adults, adults, peri-menopausal women and the elderly.

The data collected was evaluated to look for any trends. In addition data analysis was conducted using the SPSS programme version 22.0. A statistical significance was taken as equal or less than 5%. Exclusion criteria were kept to a minimum. Only those whose demographic details could not be identified on the Requisition of Plaster Slab sheet were excluded.

RESULTS

Out of 362 patients who had a plaster cast applied within the timeframe specified, 6 were excluded since their records could not be retrieved. From 356 patients,

52% were male. As shown in Figure 1, the younger age groups required the majority of plaster casts; the 16-30 years age group required 24% of the casts. Another peak occurred in the 61-75 years age group at 18%. In addition the younger age groups showed a significant greater risk of having a scaphoid or radial fracture, whilst the 31-45 years age group had a significantly increased risk of sustaining a metatarsal fracture ($p < 0.001$; LR=0.000).

Month-to-month variation was not obvious. A slightly higher incidence was found in September compared to the rest of the months but this was not statistically significant ($p=0.055$, LR= 0.07). The highest percentage of the plaster done (35%) was during the night shift (20:00 – 07:59 hours). Although the least number of casts required was during the 17:00-19:59 hours shift, this turned out to have the highest hourly turn-up of patients requiring casts. Figure 2 demonstrates the number of casts required in each time shift as well as the standardized ratio of casts done per time shift calculated as the fraction out of a 24 hour day. This therefore gave a clearer picture of which shift had the highest hourly turn-up. Area North was the catchment area which had most patients requiring a plaster at MHC for every shift, reaching 67% of the total entries. Mosta, followed by Birkirkara and St Paul's Bay were the locations which most patients came from. As expected there was a highly significant relation between the catchment area and the time of plaster application ($p < 0.001$, LR=0.000) with Central and South having significantly higher turn ups during the night shift compared to the other shifts. Figure 3 depicts these results more clearly.

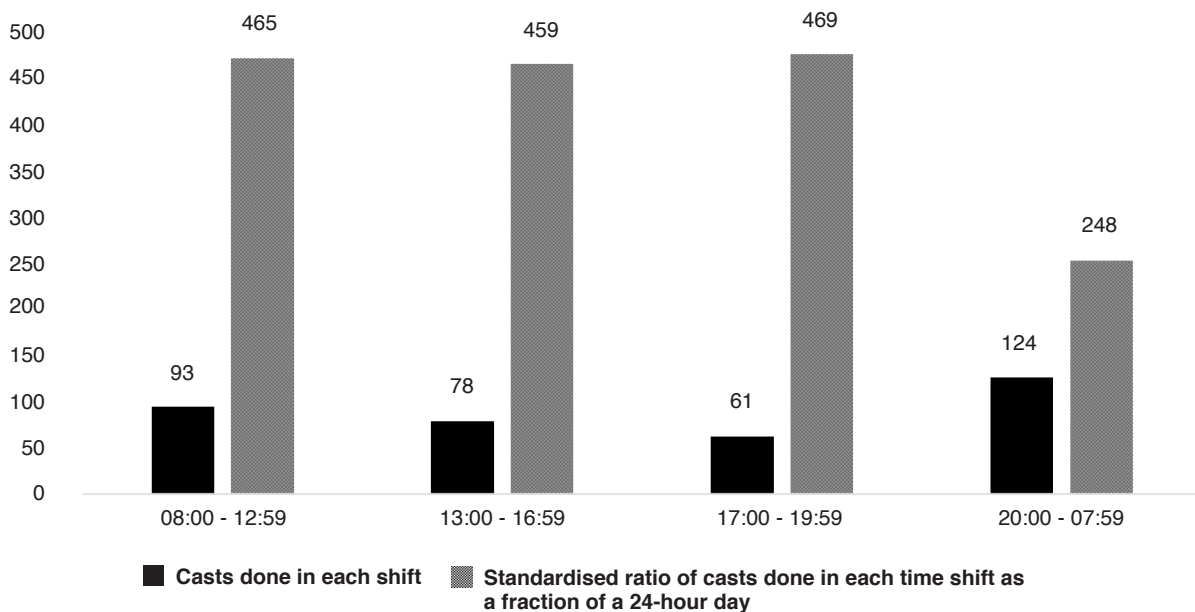


Figure 2: The standardized ratio of casts done in each time shift calculated as a fraction of a 24-hour day

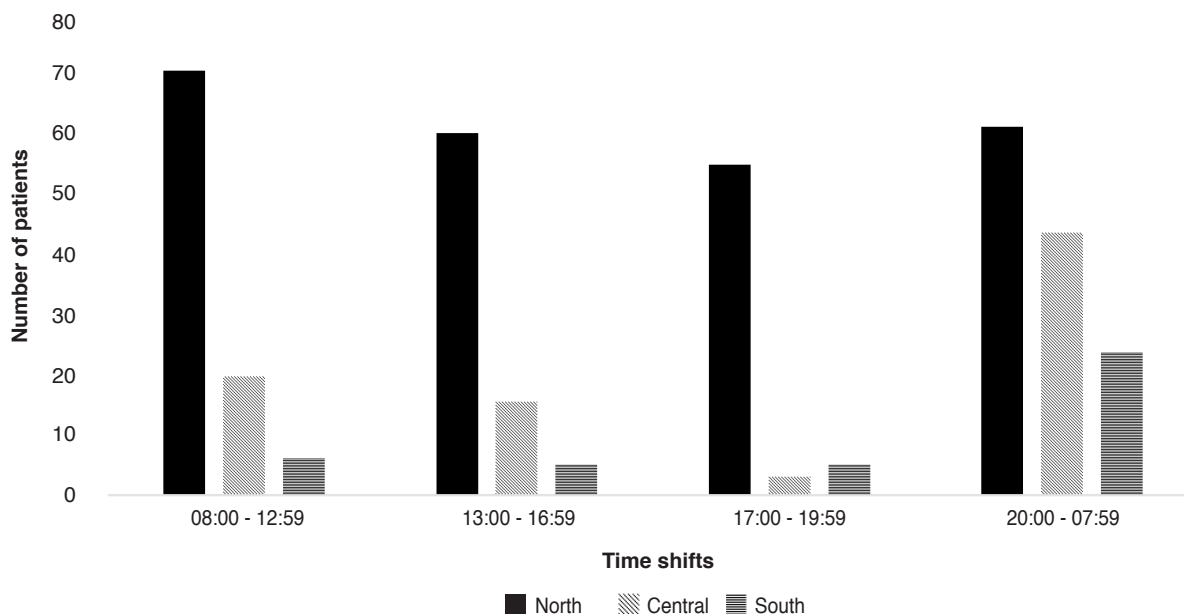


Figure 3: Patients requiring plaster casts classified by time shifts and catchment areas (North/Central/South)

Radial and scaphoid fractures were the commonest reasons for applying plaster followed by metatarsal fractures. Twelve patients (3%) had multiple bone fractures whilst another 12 patients had no clinical or radiological fracture documented (as per data collected from the sheet and iSoft Clinical Manager). This therefore excludes cases with suspected scaphoid fractures which were not visible on X-ray. The latter were included in the scaphoid fracture group. From those classified as having multiple bone fractures, 8 had a combination of radial and ulnar fractures whilst the rest had a metatarsal fracture involved together with a fibular or tibial fracture. Table 1 demonstrates the number of patients according to fracture site.

The majority of plaster slabs were checked and signed after application. This was 95% for doctors and 94% for nurses. In this study 50% of patients had at least one repeat X-ray done in the first two months following the injury. None of those who had no suspected fracture had a repeat X-ray, except for those with a suspected scaphoid fracture. No statistical differences were found between the management of different fractures. On viewing the data collected, patients with a fracture of the radius and patients with multiple fractures were more likely to have a repeat X-ray compared to other fractures. In our evaluation 55.4% of patients with a scaphoid plaster did not have a repeat X-ray.

Figure 4 demonstrates the complications related to wound healing in those who had a repeat X-ray (n=3). Out of these 3 patients, 2 had malunion (1 after radius and 1 after metatarsal fracture) and 1 had non-union

(after scaphoid fracture). Problems with the cast requiring re-application were also taken into consideration and these amounted to 5% of casts. Sixteen of these were due to broken plaster, 1 was due to circulatory problems and 1 was due to sensory problems.

DISCUSSION

Overall there was a slightly higher prevalence of fractures in males compared to females. Although no statistical significance was found between age and gender in this

Fracture Site	No. of patients
Radius	92
Scaphoid	92
Metatarsals	68
Fibula	45
Multiple bone fractures	12
No documented fractures (clinical or radiological)	12
Metacarpals	9
Tibia	8
Other carpals (ie. apart from scaphoid)	5
Navicular	4
Phalanges	4
Ulna	4
Cuboid	1

Table 1: The number of patients according to fracture site (in numerical descending order)

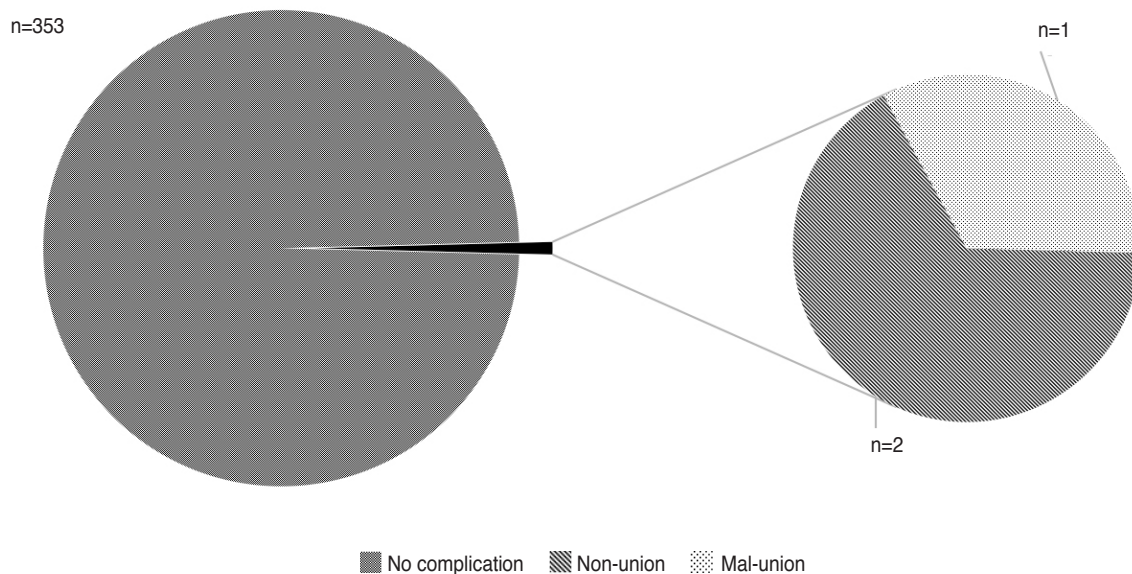


Figure 4: Complications with fracture wound healing

study, on reviewing the data there was a predominance of the male gender in the younger population and a predominance of females in the elder postmenopausal age groups. This greatly coincides with what is published in previous international studies which state that fractures in general are commoner in younger males and older females at age 50+, corresponding to the peri-/postmenopausal period in females (Curtis et al., 2016). In this study, the 46-60 years age group still had a slight male predominance and this could be explained from the fact that many women might still not have reached menopause in their 40s.

The trends of fractures with age groups are comparable to the UK 2016 report on fracture management in primary care where fractures of the carpus, foot and radius/ulna were the commonest (Curtis et al., 2016). However there are also differences compared to other research abroad. In our study there was an over-representation of metatarsal fractures (19%) when compared to other literature stating that they comprise 5-6% of all fractures in primary care (Hatch, Alsobrook and Clugston, 2007). In addition metatarsal fractures were significantly commoner in the adult age group in our evaluation and this does not correspond to the literature. In fact a review article on metatarsal fractures in 2004 claimed that metatarsal fractures make 60% of paediatric foot fractures (Rammelt, Heineck and Zwick, 2004). Although the reason for this discrepancy is not clear, one can take into account the risk factors for metatarsal fractures, including athletics, osteoporosis, obesity and diabetes. As the latter two are

very common in the Maltese adult population, this could be one factor contributing to the results (Cuschieri et al., 2016; Buttigieg, 2005).

Radial fractures were commoner in younger males and this matches previous literature (Nellans, Kowalski and Chung, 2012). In fact the percentage of fractures in the younger age groups (26.3%) in this study matches the same percentage of 26% documented in the cited study. The statistically significant higher risk of scaphoid fracture in the younger age group has also been mentioned elsewhere (Garala, Taub and Dias, 2016) and likewise there was a male predominance in these age-groups. This evaluation also confirms that scaphoid and radial fractures are amongst the commonest encountered fractures.

Seasonal variation in fracture incidence has previously been reported with a higher frequency of fractures resulting from falls occurring during the cold seasons. In this study statistical significance was reached and there are various reasons why these results differ. It is important to consider that the winter season in Malta is not as cold as in other northern countries and this therefore excludes one of the risk factors for falling – that of slipping on ice (Bulajic-Kopjar, 2000). In addition, only 6 months were included in this study – starting from late summer to early winter. This may introduce bias when trying to find a difference in season-to-season variation since most of the months included here were during autumn, when the weather in Malta is neither too cold nor too warm.

The highly significant relation between time and area is due to the fact that MHC is the only primary care centre

operating with an X-ray department for 24 hrs a day and thus patients from other catchment areas are referred to this health centre in out-of-hour periods.

Complications of fractures were minimal. As described in the introduction section, previous studies have documented that fracture care at primary health is safe and has had results comparable to specialist care. Lower percentages have been described in a large study of over 5 million patients in Scotland by Mills and Simpson (2013), but this took into consideration all fractures managed – both conservatively and operatively. Therefore this would be difficult to compare to a primary care setting where this study was carried out.

Various local complications can arise from a cast, ranging from immediate complications such as skin trauma, swelling, impaired arterial supply and compartment syndrome, to delayed complications including plaster sores, neurological impairment, stiff joints, muscle wasting and breaking or softening of the cast (Szostakowski, Smitham and Khan, 2017). Although good plaster application and care of plaster are imperative, complications may still arise. In this study most plaster casts were redone due to broken plaster. There were only two cases (forming 0.006% of the population) of neurovascular complications and both were from a below knee back slab. This confirms the importance of keeping these complications in mind when applying plaster, with neurovascular compromise and compartment syndrome being commonest in the osseofascial compartments of the leg or forearm (Mar, Barrington and Mcguirk, 2008). The anterior compartment of the leg has also been mentioned as being the site where these complications happen mostly, with tibial fractures being the commonest cause (Elliott and Johnstone, 2003). In this study, both of the two cases had a metatarsal fracture. Conducting the study in a larger population might have yielded different results.

The current practice of clinical scaphoid fractures with normal radiographs in Malta involves immobilization with plaster and a review with repeat X-ray at the Fresh Trauma Clinic in two weeks. In this study only 44.6% of patients with a scaphoid plaster had a repeat X-ray and there may be several reasons accounting for these results. First of all only plain radiographs were taken into consideration in this evaluation. Recent international guidelines, such as those from the National Institute for Health and Care Excellence, have changed, with a preference towards using advanced imaging such as magnetic resonance imaging (MRI) when X-rays are normal, rather than waiting for two weeks in plaster

(NICE, 2016). MRI is available at the main hospital and privately but not at the government primary health department in Malta. Any repeat imaging with computed tomography, bone scan or magnetic resonance were not included as well as any imaging done in a private setting. In addition some patients who are then seen at the Fresh Trauma Clinic may be clinically asymptomatic at follow up, thus excluding the possibility of scaphoid fracture and warranting removal of plaster without any required further imaging.

Strengths and limitations

This evaluation covers a whole 5-month period including both summer and autumn seasons, representing probably almost half of the total number of patients seen yearly. Although the population is not vast with a number of 356 patients involved, this study is a thorough appraisal of the Plaster Cast Service in MHC. Being a cross-sectional study, this allowed an assessment of the service in detail. Exclusion criteria were kept to the bare minimum. A limitation of this study is the fact that only one health centre was included. Gathering information from all health centres would have been ideal for a complete evaluation, especially with regards to complications with plaster casts and data on fractures in different areas. On the other hand, as MHC is the only health centre with imaging being provided over 24 hours, this study provides unique data which is of important consideration in Malta's primary health system. The time ranges taken in this study corresponded to the shifts of general practitioners working in primary care. This allowed a better overview of the time at which most fractures presented and other data related to them.

CONCLUSION

Managing fractures conservatively has been a long process of working towards a complete approach in primary care (Eiff and Saultz, 1993). The aim of this study was reached as the service was well evaluated with promising results, confirming that family doctors are managing fractures conservatively with minimal complication rates. Adherence to guidelines is recommended for the management of various fractures which can help improve the service and gain a larger number of patients who are managed entirely in primary care. This applies both for doctors managing the fractures and examining patients after application of plaster, and for nurses applying the plaster. Good documentation on the plaster application sheet is recommended. A suggestion is made to highlight

the area in the 'Requisition for a Plaster Slab sheet' which concerns the examination of the patient after plaster application; this might be a better reminder for the staff to examine the patient and hopefully further reduce complication rates.

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