Impact of Using Physiotherapy Self-Referral in the Medical–Surgical Neurological Intensive Care Unit

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ABSTRACT

Purpose: To describe physiotherapy (PT) referral practice in a medical–surgical neurological intensive care unit (MSNICU) of a large quaternary teaching hospital before and after the implementation of PT self-referral. **Methods:** Charts were reviewed for MSNICU patients who received PT pre-implementation (Pre; $n = 90$) and post-implementation (Post; $n = 100$) to collect data on timeliness, number of referrals, and MSNICU length of stay (LOS); t -tests were conducted to determine group differences. **Results:** The mean age of MSNICU patients referred to PT was 60.6 (SD = 18.6) years; 59.5% were male. PT treatment consisted of cardiorespiratory (39% Pre, 51.1% Post), mobility (22% Pre, 28.8% Post), and combined (39% Pre, 20% Post) interventions. Overall, the number of days between MSNICU admission and PT initiation and MSNICU LOS did not differ significantly from Pre to Post. However, for patients ($n = 50$) receiving early (within 7 days of MSNICU admission) PT self-referral Post versus patients receiving physician referral only Pre ($n = 83$), there was a significant decrease ($p = 0.01$) in time to PT initiation of 1.4 days (3.2 Pre, 1.8 Post). **Conclusions:** PT self-referral increased both the number of patients receiving more timely access to PT and the provision of treatment of a deferred group of patients previously not referred. Future studies need to evaluate the impact of referral methods across a variety of clinical populations.

Key Words: intensive care; professional autonomy; referral and consultation.

RÉSUMÉ

Objectif : Décrire la pratique de référence en physiothérapie (PT) dans une unité des soins intensifs médico-chirurgicaux neurologiques (USIMSN) dans un grand hôpital d'enseignement de soins quaternaires avant et après la mise en œuvre de l'autoréférence en PT (avant et après respectivement). **Méthodes :** On a étudié les dossiers pour déterminer les patients de l'USIMSN qui ont reçu des traitements de PT avant ($n = 90$) et après ($n = 100$) afin de recueillir des données sur l'opportunité, le nombre de références et la durée du séjour (DDS) à l'USIMSN; on a procédé à des tests t pour déterminer les différences entre les groupes. **Résultats :** L'âge moyen des patients de l'USIMSN référés en PT s'établissait à 60,6 (ET 18,6) ans, et 59,5% étaient des hommes. En PT, les intéressés ont reçu des traitements portant sur l'appareil cardiorespiratoire (39% avant, 51,1% après), sur la mobilité (22% avant, 28,8% après) et combinés (39% avant, 20% après). Dans l'ensemble, le nombre de jours écoulés entre l'admission à l'USIMSN et le début des traitements de PT, et la DDS à l'USIMSN, ne présentaient pas de différence significative entre le traitement avant et après. Dans le cas des patients ($n = 50$) qui ont bénéficié d'une autoréférence précoce en PT (dans les 7 jours de l'admission à l'USIMSN) après par rapport aux patients référés par un médecin seulement ($n = 83$) avant, on a constaté une diminution importante ($p = 0,01$) du temps écoulé avant le début du traitement PT qui s'est établie à 1,4 jour (3,2 avant, 1,8 après). **Conclusions :** L'autoréférence en PT a augmenté à la fois le nombre de patients bénéficiant d'un accès plus opportun aux services de PT et la prestation de traitements à un groupe reporté de patients qui n'avaient pas été référés auparavant. Des études futures doivent évaluer l'incidence des méthodes de référence dans tout un éventail de groupes cliniques.

Physiotherapy (PT) is an integral component of critical care treatment. Evidence in the literature has supported the importance of early implementation of PT interventions, especially in the intensive care unit (ICU), to prevent the sequelae of immobility while decreasing overall length of stay (LOS) and financial burden.^{1–5} Initiation of PT service in Canadian ICUs is not standardized; some units use blanket referrals, whereby all pa-

tients automatically receive a referral for PT, and others require a written requisition from a physician. Regardless, little evidence in the literature has outlined the benefits of one referral method over another.

At University Health Network (UHN), a written physician requisition is required to initiate PT services in all areas of clinical practice. In January 2012, however, a medical directive was created and implemented in the

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Box 1 Indications and Contraindications for Implementing the Physiotherapy Medical Directive at University Health Network

Intervention	Indications	Absolute contraindications	Special considerations
PT assessment and treatment	<p>All patients admitted to the specified intensive care units (TWH MSNICU and TGH MSICU)</p> <p>Patients are determined to be appropriate for PT assessment and treatment if they present with any of the following as determined by chart review by the physiotherapist:</p> <ul style="list-style-type: none"> • CXR findings of atelectasis. • Desaturation. • Secretion retention. • Respiratory distress requiring chest PT. • Extubation. • Pending intubation. • Immobility amenable to PT treatment. • New change in functional status. 	<p>Contraindications to self-referral include</p> <ul style="list-style-type: none"> • Unstable fracture. • Unclear activity order. • Severe cardiac or hemodynamic instability as evidenced by (1) status post-cardiac arrest, (2) acute myocardial infarction with new EKG changes, and (3) systolic blood pressure <80 mmHg or >200 mmHg. • Acute bleeding. • Elevated ICP greater than limits specified in MD order. 	<p>Weekend referrals will be considered following PT weekend criteria guidelines.</p> <p>Documentation in the patients' chart will occur for patients who are assessed by the physiotherapist and who do not meet eligibility criteria for assessment and treatment as per the directive.</p> <p>Unclear activity orders will be clarified by the physiotherapist with the medical team.</p> <p>Patients receiving extra-corporeal life support (ECMO/Novalung) will be assessed individually for cardiovascular stability and therapy will have to account for the cannulation site, but this does not preclude them from access to PT services.</p>

PT = physiotherapy; TWH = Toronto Western Hospital; MSNICU = medical-surgical neurological intensive care unit; TGH = Toronto General Hospital; CXR = chest x ray; EKG = electrocardiogram; ICP = intracranial pressure; ECMO = extracorporeal membrane oxygenation.

medical-surgical neurological ICU (MSNICU) that permits physiotherapists to initiate self-referral to any patient in the MSNICU, providing the patient does not have any contraindications to therapy (see Box 1). To date, no study has evaluated the impact of using PT self-referral in critical care areas.

The medical directive policy used at UHN outlines the procedure for implementation and states in part,

An authorized Physiotherapist may implement the medical directive to initiate a self-referral for Physiotherapy Assessment and Treatment for any patient admitted to the MSNICU (Toronto Western Hospital) and MSICU (Toronto General Hospital) that meet the indication criteria listed in the special considerations section. The Physiotherapist will write "Physiotherapist to assess and treat as per medical directive UHNPT001" in the orders of the paper chart.

Since implementation of the medical directive, the physiotherapists covering the specified ICUs have conducted daily screening of all patients admitted to the unit. If there is no physician order or use of standardized admission form that includes a PT check box and the patient is deemed appropriate for PT service, the physiotherapist will then self-refer to the patient following the procedure we have outlined.

Historically, in both hospitals and private practice, a medical referral from a physician was required for a patient to receive PT services.⁶ In the late 1970s, Australia changed its existing referral structure to allow physiotherapists to be primary contact professionals.⁶ In 1990, Bergman's⁷ review of Swedish physiotherapists indicated that 86% of those surveyed felt they were capable of

making their own diagnosis and prescribing an appropriate PT treatment. The practice change permitting physiotherapists to be primary contact professionals was believed to be appropriate on the basis of the maturity and expertise of the PT profession and the notion that physiotherapists were capable of providing responsible, dedicated, and optimal care without depending on the medical profession for referrals.⁸ Although Canada made the same change in 1991 with the Regulated Health Professions Act,⁹ it applied only to physiotherapists in private practice settings; in the hospital sector, the Hospitals Act¹⁰ requires a physician's referral before initiation of PT. PT self-referral services have been successfully implemented in outpatient clinics without any safety concerns or adverse effects.

In the acute care setting, physiotherapists are considered integral members of the inter-professional health care team. Ferguson and colleagues¹¹ have suggested that having PT within a health care team also helped to foster close multi-professional working relationships and noted that concerns about being inundated with over-referral or missing significant safety issues had not been borne out in primary care under the National Health Service in the United Kingdom.¹¹

The purpose of our study was to gather evidence on PT referral practice for patients in the MSNICU at Toronto Western Hospital. We evaluated the impact of PT self-referral in the MSNICU, specifically measuring (1) any differences in time to access PT service, (2) time to access PT service, and (3) referral volume from before to after implementation of PT self-referral.

We anticipated that the results would help us understand referral practice and aid in the future development of medical directives for other units throughout the hospital and for other facilities as a means of improving inpatient access to PT services.

METHODS

Study design

Our study used a retrospective study design with patient charts as the data source.

Identification of sample and data retrieval process

We retrieved PT census records for the study periods and used them to compile a list of names and medical record numbers for all patients who (1) were admitted to MSNICU during either the pre-implementation period (Pre) or the post-implementation period (Post) and (2) had a PT attendance record (includes consultation, intervention, or both).

We intended to collect data on an equal number of patients for each data collection period, using a convenience sampling method: the first 100 consecutive patients to receive PT assessment or a data collection period of 6 months, whichever came first. Data collection took place over 6 months for Pre and 3 months for Post. The study received approval from the UHN Research Ethics Board and complied with all of its regulations.

Data collection

Data gathered electronically via chart review were manually entered into MS Excel 2010 (Microsoft Corp., Redmond, WA) and then imported into SPSS for Windows version 16 (SPSS Inc., Chicago, IL) for subsequent analysis. One member of the research team conducted all chart reviews. All data sets were de-identified, and each chart was assigned a unique three-digit study identification number. There were no missing data, so the entire data set from the 190 patients was used for the study.

For the purposes of the study, we developed the following operational definitions based on the bedside PT clinician's experience with the patient population treated in this particular unit:

- *Early PT initiation:* PT initiated within 7 days after patient admission to the MSNICU and
- *Deferred PT initiation:* PT initiated more than 7 days after patient admission to MSNICU (as a result of medical instability).

Outcomes measured

The primary outcomes measured were timeliness (time in days between MSNICU admission and PT initiation) and workload (number of patients receiving PT interventions per day). The same outcomes were collected for both time periods.

Data analysis

We calculated descriptive statistics (frequency counts, means, medians, and standard deviations, as appropriate) for basic demographics of the samples from the two time periods (Pre and Post). We conducted independent-samples *t*-tests, with α set at 0.05, to determine whether the two patient populations differed from one another in terms of any demographic variables. Open-ended responses (i.e., diagnosis) were analyzed and sorted into groups according to evident trends or common themes.

We further explored the data by separating those who received PT treatment into two groups: early PT initiation versus deferred PT initiation. Between-group differences were determined using *t*-tests, with significance threshold set at $p \leq 0.05$.

RESULTS

Demographic characteristics of the sample

Demographic characteristics of the sample are presented in Table 1. In the overall sample, patients referred to PT had a mean age of 60.6 (SD 18.6) years; the majority (59.5%) were male. There were no significant differences in age or gender between the two samples ($p > 0.05$).

The medical service was the most frequent admitting service for both time periods; just more than one quarter of Post patients were admitted from the neurosurgery service, a significant increase from Pre ($p = 0.02$). The most common reasons for admission to MSNICU were respiratory causes (e.g., pneumonia, chronic obstructive pulmonary disease, acute respiratory distress syndrome), neurological causes (e.g., cerebrovascular accidents, subdural and subarachnoid hematomas, seizures, tumours), and postoperative complications.

Referral practice

All Pre patients ($n = 90$) were referred to PT by a physician; 62 Post patients (62%) were initiated by PT self-referral, and 38 (38%) were initiated by physician referral. With the exception of 3 (3.3%) Pre referrals considered inappropriate for PT because of pulmonary hemorrhaging, hemodynamic instability, or ongoing medical work-up, all other referrals during both study periods were considered appropriate, in the sense that the patient had no contraindications to initiation of PT (as outlined in the self-referral policy). No data were collected on the number of patients who were screened but did not receive a PT self-referral as a result of such contraindications.

Caseload volume

We reviewed 90 consecutive patient charts for the period January–June 2011 (Pre) and 100 consecutive charts for the period January–March 2012 (Post). We found no significant difference ($p > 0.05$) in the average

Table 1 Demographics of MSNICU Patients Treated by Physiotherapy

Characteristic	No. (%) of patients*	
	Pre (<i>n</i> = 90)	Post (<i>n</i> = 100)
Age, y, mean (SD), range	58.7 (18.9), 18–89	62.6 (18.1), 18–97
Sex		
Male	58 (64.4)	55 (55.0)
Female	32 (35.5)	45 (45.0)
Admitting service		
Medical	76 (84.4)	55 (55.0)
Spine	1 (1.1)	3 (3.0)
Neurosurgery†	4 (4.4)	26 (26.0)
Neurology	6 (6.7)	4 (4.0)
Orthopaedic	2 (2.2)	1 (1.0)
General surgery	1 (1.1)	11 (11.0)
Diagnostic populations treated		
Respiratory	33 (36.7)	31 (31.0)
Neurological	29 (32.2)	45 (45.0)
General surgery	21 (23.3)	15 (15.0)
Cardiac	5 (5.6)	3 (3.0)
Complications post-orthopaedic surgery	1 (1.1)	1 (1.1)
Other (allergic reaction, necrotizing fasciitis, malnutrition)	1 (1.1)	2 (2.0)
PT intervention provided		
Cardiorespiratory	45 (50.0)	39 (39.0)
Mobility	26 (28.9)	22 (22.0)
Cardiorespiratory and mobility	19 (21.1)	39 (39.0)

*Unless otherwise indicated.

†Significant difference between Pre and Post ($p = 0.02$).

MSNICU = medical–surgical neurological intensive care unit; Pre = pre-implementation period; Post = post-implementation period; PT = physiotherapy.

number of patients on the daily PT caseload (14.7 for Pre vs. 14.3 for Post) or the average number of occupied beds in the 24-bed unit (21.1 for Pre vs. 21.8 for Post). For both time periods, PT had approximately two thirds of the patients in the MSNICU on their caseload. The number of new referrals per day was more than 1 on 5 occasions during the Pre period and 31 occasions during the Post period.

Timeliness of PT initiation

Regardless of referral method, the majority of patients in both time periods (>80%) had PT initiated within 7 days of admission to MSNICU. Of Post patients referred by PT self-referral, 50 of 62 (80.6%) received early PT initiation, whereas 12 (19.4%) received deferred PT initiation. Of those referred by a physician, 35 of 38 (92.1%) received early PT initiation and fewer than 10% (3 of 38; 7.9%) received deferred PT initiation. PT initiation was slightly, though not significantly ($p = 0.30$), later in the Post period (mean 3.5 [SD 3.3] days) than in the Pre period (mean 3.3 [SD 4.7] days) because of patients' medical status and neurological instability.

Although time to PT initiation for patients referred by physician in the Post period ($n = 38$) was slightly earlier (mean 2.7 [SD 2.9] days) than at Pre (mean 3.3 [SD 4.7] days), when the only access to PT was via physician referral, the difference was not significant ($p = 0.23$). There was a significant decrease of 1.4 days for initiation of PT ($p = 0.01$) for patients receiving early PT initiation via

self-referral in the Post group relative to the Pre group ($n = 83$), who received their PT referral only via physician (3.2 days Pre vs. 1.8 days Post). However, although there was a decrease of 0.7 days for patients who received early PT initiation via self-referral (1.8 days, $n = 50$) compared with those patients who received early PT initiation via physician referral Post (2.5 days, $n = 35$), it was not significant ($p = 0.06$).

The deferred PT initiation group in both cohorts had a significantly longer delay than that of the early PT initiation group (Pre = 3.2 vs. 12.1 days, $p < 0.001$, Post: PT self-referral = 1.8 vs. 10.6 days, $p < 0.001$, and physician referral = 2.5 days vs. 11.1, $p < 0.001$). See Table 2 for further details.

MSNICU length of stay

We found no significant ($p = 0.93$) differences in MSNICU LOS between Pre (12.7 days) and Post (13.0 days) cohorts. In the deferred PT initiation group, 12 of 62 (19.4%) had a mean MSNICU LOS that was more than twice as long (28.8 [SD 12.6] days) as that of the early PT initiation group (11.4 [SD 20.7] days).

DISCUSSION

Our retrospective cohort study found that the implementation of PT self-referral improved timeliness of PT initiation for a select group of patients and that PT self-referral allowed the identification of a group of patients who had been in the ICU for more than 7 days who were subsequently treated with PT.

Table 2 Timeliness of PT Initiation and Length of Stay in MSNICU

Measure	Pre: physician referral only, d, mean (SD), range			Post, d, mean (SD), range						
	Group (n = 90)	≤7 d (n = 83)	>7 d (n = 7)	Group (n = 100)	Physician referral			Physiotherapy self-referral		
					Group (n = 38)	≤7 d (n = 35)	>7 d (n = 3)	Group (n = 62)	≤7 d (n = 50)	>7 d (n = 12)
Time to PT initiation	3.3 (4.7), 0.1–24.3	3.2 (3.7), 0.1–7.0	12.1 (5.6), 8.7–24.3	3.5 (3.3), 0.2–13.5	2.7 (2.9), 0.2–13.5	2.5 (1.5), 0.2–6.7	11.1 (2.0), 8.9–12.3	4.0 (3.5), 0.2–12.3	1.8 (1.2), 0.2–7.0	10.6 (2.1), 7.6–12.3
MSNICU LOS	12.7 (21.3), 0.0–69.4	10.3 (13.2), 0.0–67.1	41.6 (57.6), 8.7–169.4	13.0 (20.2), 0.2–171.6	8.6 (9.4), 0.2–40.6	8.0 (9.6), 0.2–40.6	14.8 (2.7), 11.6–16.3	13.0 (20.2), 0.2–171.6	11.4 (20.7), 0.2–171.6	28.8 (12.6), 10.5–42.9

PT = physiotherapy; MSNICU = medical–surgical neurological intensive care unit; Pre = pre-implementation of PT self-referral directive period (2011); Post = post-implementation of PT self-referral directive period (2012); LOS = hospital length of stay; ≤7 d = PT initiated within 7 days of MSNICU admission; >7 d = PT interventions initiated more than 7 days after MSNICU admission.

ICUs are considered to be staffed by “expert personnel with specialist training.”^{12(p.988)} Physiotherapists working in these units, although not defined as specialists, develop an advanced understanding of critical care theory, medical technologies, and clinical experience used to guide both cardiorespiratory and functional patient care.¹² The literature has supported early involvement of PT in the ICU as a means of preserving organ system function and preventing secondary medical complications while working to restore lost function.^{1,12} This study described the impact of a change in PT referral practice and the implementation of PT self-referral within the MSNICU. We expected that this practice would result in earlier involvement in PT; to test this hypothesis, we compared objective outcomes such as timeliness of PT initiation, number of patients referred, and length of MSNICU stay in two cohorts of patients—one receiving PT via physician referral and the other via PT self-referral and physician referral—and between different referral methods (physician referral, PT self-referral).

Referral practice

Because of a lack of research examining the ideal referral method in critical care units for allied health professionals, variations exist among facilities. Although professional autonomy for physiotherapists working in outpatient clinics has functioned satisfactorily for more than 3 decades in many developed countries,⁸ Canadian acute care facilities continue to rely on physician-initiated referrals to allied health professions. At UHN, until very recently the only method of referral to PT services was by written physician order. The development of PT self-referral in the MSNICU was supported by both medical and PT teams as a way of evaluating whether self-referral would improve timely access to PT service for critical care patients. After implementation, PT self-referral complemented rather than precluded ongoing provision of medical orders and referrals from physicians; in fact, almost 40% of patients were seen via physician referral

even after PT self-referral was in place. In all likelihood, those referred via physicians—92.1% of them within 7 days of admission—would have been self-referred by PT as part of routine practice, but a physician referral was written during off hours or over the course of the day as a result of a change in the physical condition of a patient who had contraindications to PT at the time of morning PT screening.

One interesting finding was that a larger percentage of neurosurgical patients were self-referred to PT than before self-referral. Perhaps this population was not routinely referred for PT intervention before the implementation of PT self-referral because medical care took priority during their relatively long critical illness, because the involvement of multiple physician groups (ICU intensivist, neurosurgeon) resulted in a loss of communication, or because other health professionals may not fully understand the benefit of early PT intervention. It is also possible that the PT service was being underused by physicians before the implementation of the medical directive.

Caseload volumes

Although day-to-day caseloads remained essentially unchanged, the number of patients treated by PT has increased with PT self-referral, as evidenced by the increased volume of referrals over a shorter time frame. This finding is not surprising because caseload volumes were expected to increase post-implementation. Holdsworth and Webster¹³ reported considerable implications for increased PT caseload volumes associated with direct access in primary care. An interesting finding was the increased size of the deferred PT initiation group, which consisted mainly of neurosurgical patients. PT was not initiated earlier for this population subset because of medical or neurological instability early in the MSNICU admission. Our ICU uses preprinted admission order sets that include a checkbox for PT referral; however, PT is often inappropriate because of medical instability at

the time of admission and is therefore omitted from the form. We attribute the growth of this population in the Post period to the daily screening and use of PT self-referral to capture patients who might previously have been unintentionally omitted. No patient safety concerns emerged related to over-referral or increased volumes.¹²

Timeliness

Our findings show that PT self-referral resulted in more timely access to PT services in the MSNICU for a select group of patients. On the basis of these encouraging findings, the use of PT self-referral may serve as a referral process model for other programs and with other patient populations.

The benefits of early PT intervention have been well documented in the literature, especially in the critical care environment,¹⁻⁵ and early PT intervention has been found to be safe, with no documented serious adverse events through 17 reviewed studies.¹⁴ Owing to the medical coverage structure at UHN, however, referrals have not always been received in a timely manner or at a medically appropriate time. Our results indicate that use of PT self-referral decreased the delay between admission to MSNICU and PT initiation for medically stable patients, which suggests that the physiotherapists in this unit are more in tune with this population's suitability for PT initiation and may also indicate that implementing PT self-referral increased awareness of PT across the entire inter-professional team. The decreased delay to PT initiation is in line with current practice outlined in the literature identifying the benefits of early PT,¹⁻⁵ as well as the physiotherapists' knowledge base with respect to working in critical care environments.¹²

Physiotherapists working in critical care have an advanced understanding of medical stability as it relates to PT practice,¹² which gives them a basis for initiating PT service as soon as is appropriate. An observational study by Zeppos and colleagues (2007)¹⁵ reported an extremely low incidence of adverse events during PT intervention, indicating the safety associated with PT in critical care environments, and Stiller's¹⁶ systematic review agreed that early progressive mobilization is feasible and safe in the ICU. In our study, the majority of both PT self-referral and physician referral patients received early PT initiation after the implementation of the PT self-referral. We did not collect data on the number of patients who were screened by PT and deemed not to meet self-referral criteria, because this was considered part of daily practice after the initiation of PT self-referral. Although the group of patients who were inappropriately referred to PT by the physician group in the pre-implementation period, and therefore received no PT intervention, was small, in the post-implementation period no inappropriate referrals were received from the physician group.

There may be many reasons to delay initiation of PT for critical care patients, including elevated troponins, active gastrointestinal bleed, scheduling and staffing issues, a need to return to the operating room, hemodynamic instability, and agitation. It is our belief that physiotherapists are better able than other health care providers to understand limitations related to PT initiation. The delays associated with non-medically related issues, such as inter-professional communication of referrals or referral omission, can be minimized when professional autonomy is permitted. The neurosurgical population of the MSNICU in some cases requires delaying the initiation of PT for medical reasons related to neurological instability; in fact, nearly 20% of Post patients in our study received deferred PT initiation for this reason. Nonetheless, the benefits of initiating PT during critical illness have been well documented, and PT continues to be recommended once the patient is medically stable.

LIMITATIONS

Our study has several limitations. Our data set did not include patients who were never referred to the PT service; because we used retrospective data for the Pre period, the charts provided by medical records department to meet our study criteria (ICU admission during Pre or Post period; recorded attendance visit by physiotherapist) may not represent a complete record.

CONCLUSION

Use of PT self-referral resulted in more timely access to PT services for a subset of MSNICU patients. Future studies should evaluate the impact of earlier PT interventions on patient function and outcomes, as well as the impact of using medical directives in other in-patient populations and treatment settings.

KEY MESSAGES

What is already known on this topic

PT self-referral has been successfully implemented in outpatient settings, but similar studies have not been conducted with in-patients. PT provision in the critical care environment is both safe and feasible.

What this study adds

This study described referral practice of patients admitted to the MSNICU using two different referral paradigms and identified changes to caseload volume and types of patients receiving PT interventions before and after the implementation of a medical directive in the critical care unit of an urban quaternary hospital. The study provides a rationale for future development of PT self-referral procedures for other inpatient populations.

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