Cardiorespiratory Physiotherapy around the Clock: Experience at a University Hospital

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ABSTRACT

Purpose: To document and describe the use of a hospital-wide, 24-hour cardiorespiratory physiotherapy service run by an intensive care unit (ICU) team of physiotherapists. **Methods:** We prospectively collected data on all non-ICU hospital patients who used the 24-hours-per-day cardiorespiratory physiotherapy service over a 1-year period between July 2013 and June 2014. The ICU physiotherapists documented the reason, origin of referral, time of call, and type and frequency of treatment of each patient. **Results:** Over the 1-year period, the ICU physiotherapists administered 2,192 out-of-hours cardiorespiratory physiotherapy treatments ($n = 685$ patients) outside the ICU. Most referrals originated from the emergency department (25%), the cardiopulmonary transplant unit (20%), and the pulmonology department (16%). Referrals were from a physiotherapist in 49% of cases, from a nurse in 32%, and from a physician in 19%. Of these, 89% were made between 4:00 p.m. and 8:00 a.m., and sputum retention was the most frequent reason (86%). **Conclusion:** Although proving its cost effectiveness is difficult, organizing a 24-hours-per-day, 7-days-per-week cardiorespiratory physiotherapy service in a large hospital is feasible.

Key Words: after-hours care; cardiorespiratory physiotherapy; quality of healthcare; respiratory care.

RÉSUMÉ

Objectif : documenter et décrire la pratique d'un service de physiothérapie cardiorespiratoire 24 heures sur 24, 7 jours sur 7, destiné à tous les patients de l'hôpital et assuré par l'équipe de physiothérapeutes de l'unité des soins intensifs (USI). **Méthodes :** nous avons collecté des données de manière prospective auprès de l'ensemble des patients hospitalisés en dehors de l'USI qui ont eu recours au service de physiothérapie cardiorespiratoire 24 heures sur 24, 7 jours sur 7 sur une période d'un an, de juillet 2013 à juin 2014. Les physiothérapeutes de l'USI ont consigné le motif, l'origine et l'heure de l'appel, le type, la durée et la fréquence du traitement pour chaque patient. **Résultats :** au cours de la période d'un an, les physiothérapeutes de l'USI ont administré 2 192 traitements de physiothérapie cardiorespiratoire en dehors des heures normales ($n = 685$ patients) à l'extérieur de l'USI. La plupart des patients étaient hospitalisés aux urgences (25%), dans l'unité de transplantation cardiopulmonaire (20%) et dans le département de pneumologie (16%). Les appels provenaient d'un physiothérapeute dans 49% des cas, d'un infirmier dans 32% et d'un médecin dans 19%. Parmi ceux-ci, 89% ont été faits entre 16 h et 8 h. Le désencombrement bronchique était le motif le plus fréquent (86%) de demande de traitement. **Conclusion :** bien qu'il soit difficile d'en prouver la rentabilité, l'organisation d'un service de physiothérapie cardiorespiratoire 24 heures sur 24, 7 jours sur 7, dans un grand hôpital est faisable.

Intensive care units (ICUs) bring together critically ill patients and advanced technology but also expert personnel with specific training. In most hospitals in developed countries, physiotherapists are seen as integral members of the team that manages these patients.¹ The precise role that ICU physiotherapists play varies considerably from one centre to another.² In some countries, particularly the United States, respiratory therapists and physiotherapists have clearly defined separate functions. In others, including Belgium, the roles overlap, and physiotherapists are involved in various aspects of respiratory

care—including secretion mobilization, adjusting ventilator settings, weaning, extubation, and initiating and supervising non-invasive ventilation (NIV)—as well as patient mobilization and positioning.³

The involvement of physiotherapists in more specialized procedures is also a function of the number of physiotherapists working (exclusively) in the ICU. In guidelines published by the European Society of Intensive Care Medicine, one dedicated physiotherapist for every 12 beds, available 24 hours per day, 7 days per week (24/7), is considered desirable in low-care units and

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Contributors: All authors designed the study; collected, analyzed, and interpreted the data; drafted or critically revised the article; and approved the final draft.

Competing Interests: None declared. Institutional funds only.

Physiotherapy Canada 2016; 68(3);254–258; doi:10.3138/ptc.2015-40

essential in medium- to high-care units (defined as units with a nurse-to-patient ratio of 1:1).⁴ In practice, however, 24-hour availability of physiotherapists, even in the ICU, is generally uncommon.^{2,5,6} In contrast to the medical and nursing professions, in which 24/7 coverage is standard, physiotherapy services in many acute-care facilities are provided just 5 days per week, with reduced or no services provided in the evenings and overnight or on weekends.⁵ In a European survey conducted in 2000,² 85% of European ICUs had a physiotherapist available on the weekend, but only 34% had one available at night. A more recent Australian survey reported that 80% of hospitals offering highly acute care provided physiotherapy services on a Saturday,⁶ but only 30% of hospitals offering subacute care offered such services.

In 2000, a 24/7 cardiorespiratory physiotherapy system covering the whole hospital, but run by the ICU physiotherapy team, was instituted at our hospital; not only were nurses, physiotherapists, and doctors becoming increasingly concerned that patients were deteriorating overnight as a result of sputum retention, but general ward nurses had also requested overnight services because they believed that the presence of a physiotherapist would help ensure adequate respiratory treatment during the night. A similar system had been successfully instituted in another academic hospital in Belgium. The purpose of this study was to prospectively gather data from this service over a 1-year period to describe and better understand how it was used.

METHODS

Study site

The study was conducted at Erasme Hospital in Brussels, an 850-bed, tertiary care (primarily for adults) university hospital. The study was approved by the institution's ethics committee.

Before June 1, 2000, physiotherapy services, including cardiorespiratory physiotherapy, were provided in the hospital from 8:00 a.m. to 5:00 p.m. during the week and from 8:00 a.m. to 12:00 p.m. on Saturday, Sunday, and official holidays. Starting on June 1, 2000, services were expanded to provide 24/7 coverage: In addition to the physiotherapy service offered during standard hours, a physiotherapist from the ICU team is now on call in the hospital for cardiorespiratory physiotherapy from 4:00 p.m. (allowing referrals to be accepted from the daytime physiotherapists just before the end of their shift) until 8:00 a.m. on weekdays and from 12:00 p.m. to 8:00 a.m. on weekends and official holidays. When it is considered that a patient would benefit from cardiorespiratory physiotherapy, physicians, nurses, or other physiotherapists can make a referral to the ICU physiotherapy team. Cardiorespiratory physiotherapy includes performing basic chest physiotherapy (using airway clearance techniques such as positioning, forced expiratory

techniques, assisted coughing, and suctioning), assisting with collecting sputum, applying aerosol therapy, monitoring respiratory and ventilator parameters, and initiating or supervising continuous positive airway pressure (CPAP) and NIV.

The Department of Intensive Care has 32 beds plus a 4-bed stabilization unit ("shock room").⁷ The department currently employs 12 physiotherapists (average length of experience 16 years, range 1–37 years); this corresponds to 7.8 full-time equivalents (FTEs). Three of these physiotherapists (2.5 FTEs) were hired to cover the new 24/7 schedule. In addition to providing around-the-clock cardiorespiratory physiotherapy services to ICU patients, this physiotherapy team provides 24/7 cardiorespiratory physiotherapy support to all hospitalized patients and those admitted to the emergency department or stabilization unit. The physiotherapists also assist long-time home users of NIV who are referred for adjustment of their ventilation. To cover this service, three ICU physiotherapists are on duty during normal hours and one physiotherapist is on duty at other times.

Quantifying 24/7 cardiorespiratory physiotherapy

We prospectively included all patients referred to the ICU physiotherapy team for cardiorespiratory physiotherapy during the 1-year period. We developed a standardized data collection form for hospital patients treated outside the ICU (the focus of this study) and provided a list of definitions to the physiotherapists (Table S1, online supplement). The physiotherapists completed one data form for each treatment performed; one treatment could include several different cardiorespiratory physiotherapy interventions. The physiotherapists entered the time, reason for, and origin of the referral as well as the type, duration, and frequency of treatment into an electronic database, and the two principal investigators (MD and CB) double-checked the database against the data collection forms to ensure that the data entry was accurate. We conducted a pilot test of the form during 2009 and 2010, before it was put into formal use from July 1, 2013, to June 30, 2014. We use descriptive statistics to summarize the data.

RESULTS

During the 1-year period, the ICU physiotherapists administered 18,318 treatments, 2,192 of which were cardiorespiratory physiotherapy treatments for patients outside the ICU. The ICU physiotherapists therefore administered a mean of 6 treatments (range 0–20 treatments) per 24 hours outside the ICU. A total of 56% of the referrals were received on weekends and official holidays; 89% of all referrals were received between 4:00 p.m. and 8:00 a.m. (Figure S1, online supplement). If a patient's condition was critical, the physiotherapist administered the appropriate treatment immediately; for patients whose condition was stable, the time between

Table 1 Physiotherapy Interventions Outside the ICU

Component	No. of treatments	% of total treatment episodes ($n = 2,192$)*
Cardiorespiratory physiotherapy	1,884	86
Suctioning	986	45
Using tracheostomy	347	16
Using naso- or orotracheal tube	639	29
Continuity of cardiorespiratory care after discharge from ICU	417	19
Assessment/pulse oximetry monitoring	674	31
Sputum collection	293	13
Aerosol therapy	75	3
Oxygen delivery or adaptation	144	7
Evaluation of gas exchange	74	3
Ventilator parameter monitoring	581	27
NIV or CPAP (initiation and/or supervision)	559	25
Acute	200	9
Long-term	359	16
End-of-life support (psychological support or respiratory care)	19	1

*Each treatment episode could include several types of intervention.

ICU = intensive care unit; NIV = non-invasive ventilation; CPAP = continuous positive airway pressure.

the referral and the intervention was always less than 1 hour.

Most requests came from the cardiopulmonary transplant unit, the pulmonology department, the shock lab, and the emergency department (Figure S2, online supplement). In 41% of cases, referrals were made directly by the ICU physiotherapy team because the patient needed continuing physiotherapy on the general ward after being discharged from the ICU. Other referrals came from nurses (32%), a physician (19%), and the general ward physiotherapist in charge of the patient (8%).

Patients were most often referred for the prevention or treatment of respiratory complications (86% of cases), such as sputum retention or atelectasis. The most common interventions used airway clearance techniques, such as positioning, forced expiratory techniques, and assisted coughing. In almost half the requests ($n = 986$), the patient needed suctioning (see Table 1). In 26% of cases, physiotherapists were involved in managing patients with acute, subacute, and chronic respiratory conditions requiring NIV or CPAP.

The majority of treatments requested by the emergency department were performed in the stabilization unit, and interventions most commonly included initiating CPAP or NIV (72%) and bronchial drainage (48%). Only 58% of patients treated in the stabilization unit were admitted to the ICU; the other patients were transferred to the emergency department (11%) or general ward (31%). One patient died.

Treatments lasted an average of 19 minutes. In 7% of cases, they lasted less than 15 minutes (quick evaluation); in 11% of cases, 15 minutes; in 5% of cases, 16–19 minutes; in 17% of cases, 20 minutes; and in 45% of cases, 21–30 minutes. In patients with acute respiratory failure, monitoring and treatment required several inter-

ventions that each last more than 30 minutes (to as long as 100 minutes) in 15% of cases. The mean number of treatments was 3.2 per patient for each hospital stay. In 57% of cases, a single treatment was administered, and 74% of patients received one or two treatments (Figure S3, online supplement). The number of inappropriate referrals (as judged by a physiotherapist) was small (23 calls over the study period, or 1% of total calls). There was no seasonal variation in timing or type of physiotherapy request.

DISCUSSION

To our knowledge, this is the first study to describe the routine practice of 24/7 cardiorespiratory physiotherapy outside the ICU using prospectively collected data. Patients requiring around-the-clock physiotherapy often, but not always, have acute or subacute respiratory conditions;⁵ these can rapidly alter a patient's clinical status and often require intensive physiotherapy, necessitating several treatments per day and sometimes treatment at night.^{8,9} The availability of 24/7 cardiorespiratory physiotherapy allows therapy to be started early, thereby avoiding the need to wait until the next morning or after the weekend and thus potentially improving patient care and outcomes.

There are relatively few published data regarding the demand for and effects of 24/7 availability of physiotherapy. The University Hospital of Wales has reported its experience, in which six extra physiotherapists were recruited to enable 7-day and evening physiotherapy for acute medical patients.¹⁰ Physiotherapy focused on avoiding admission, preventing deterioration after admission, and facilitating early discharge. As a result, response times improved, and length of stay (LOS) was reduced by 1.5 bed days per patient.¹⁰ Other studies have also shown

that providing physiotherapy 7 days a week rather than 5 can significantly decrease hospital LOS in various patient populations^{11,12} and can be associated with decreased morbidity and mortality.¹³ A recent study has shown that physiotherapy care provided 24 hours per day for hospitalized patients in the ICU was associated with reduced LOS, mechanical ventilation support, pulmonary infection, and mortality compared with physiotherapy care provided 6 hours a day.¹⁴

Some studies have not reported a beneficial effect on LOS,¹⁵ but various hospital organizational factors, including discharge protocols, can affect LOS, making it difficult to interpret across studies.¹⁶ In addition, studies have differed markedly in how they have defined out-of-hours physiotherapy service provision, the criteria used to determine eligibility for out-of-hours referral,⁵ and the treatments performed by physiotherapists; all of these factors makes it difficult to compare results.

In addition to the lack of data regarding the effectiveness of 24/7 physiotherapy services, concerns about the costs of providing out-of-hours service may help explain why many hospitals offer reduced physiotherapy services on weekends.¹⁶ Data on this aspect are limited, particularly for the acute-care setting. Morris and colleagues¹⁷ reported no increase in costs when a mobility protocol that included 7-day physiotherapy was instituted for ICU patients with acute respiratory failure compared with the usual 5-days-per-week care. It is interesting to note that, in our institution, the number of inappropriate calls (e.g., requesting respiratory therapy that was unlikely to be beneficial) during the study period was small, although, in a study conducted in an academic community hospital in 1996, Alexander and colleagues¹⁸ reported that more than 50% of chest physiotherapy treatments had been ordered for inappropriate indications.

The provision and continuity of cardiorespiratory physiotherapy and monitoring by a physiotherapist complement the roles of nurses and physicians, and they may contribute to more rapid transfer of patients to less expensive hospital services or even earlier discharge from hospital.^{11,17,19,20} It was beyond the scope of the current study design to quantify the benefit generated by continuous physiotherapy in terms of comfort or satisfaction of patients and their families, quality of care, or possible cost savings. Ideally, this study would have been quasi-experimental, but no data were available before this continuing service was developed, and the institutional ethics committee would not give permission for patients to be randomized.

CONCLUSION

This is the first study to prospectively characterize and describe 24/7 physiotherapy care over a relatively long period. The out-of-ICU cardiorespiratory physiotherapy workload added 14% to existing ICU physiotherapy interventions; care was provided mostly at night

(from 4:00 p.m. to 8:00 a.m.) and consisted largely of assisted coughing or suctioning. Providing cardiorespiratory physiotherapy outside regular working hours allows for more continuous management of acute respiratory conditions. However, more work needs to be done to assess and evaluate the clinical benefits of this service strategy for the quality of patient care and, because it requires significantly more staff, for health care costs.

KEY MESSAGES

What is already known on this topic

Many acute care facilities provide physiotherapy services just 5 days a week, with reduced or no service provided in the evenings, overnight, and on weekends. In a European survey conducted in 2000, 34% of European intensive care units (ICUs) had a physiotherapist available during the night, and 85% had one available during the weekend. A more recent Australian survey reported that physiotherapy services were provided on a Saturday in 80% of acute care hospitals but in only 30% of subacute care hospitals. A change to a 7-day and extended-day physiotherapy service for acute medical patients in a university hospital in Wales was associated with reduced patient lengths of stay. An out-of-hours cardiorespiratory physiotherapy service covering the whole hospital but run by ICU physiotherapists has been successfully implemented in another academic hospital in Belgium.

What this study adds

This is the first study to prospectively characterize a 24/7 cardiorespiratory physiotherapy service run by an ICU team of physiotherapists in a university hospital. The out-of-ICU cardiorespiratory physiotherapy workload added 14% to existing ICU physiotherapy interventions; care was provided mostly at night (from 4:00 p.m. to 8:00 a.m.) and consisted largely of assisted coughing or suctioning. Our results, gathered over a 1-year period, provide additional evidence to support implementation of such a system. However, further work is necessary to assess and evaluate the clinical benefits of this approach on the quality of care for patients and on health care costs because the resource implications in terms of staffing are significant.

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