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ORIGINAL ARTICLE

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Clinical staff work sampling in a neurorehabilitation hospital and its relationship to severity of disease

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Abstract

Aim: Study aimed to analyse how rehabilitation staff spends working time on specific activities in a neurorehabilitation hospital and to determine the number of direct activities received by patients with different levels of disease severity.

Background: Few studies have investigated how clinical staff spends their time on activities in rehabilitation hospitals without considering at the same time all working categories and without reporting the number of direct activities received by patients with respect to their disease severity.

Design: Self-reported observational study.

Method: Work Sampling Technique was used to record direct, indirect, unit-related and personal activities every 5 min for 2 days.

Results: Total of 6,974 activities were recorded over 581 working hours. Physiotherapists and nurses spent 75.2% and 54.8% of their time in direct activities and medical doctors only 25.4%. Total time of direct activities was significantly different among worker categories ($p = 0.001$) and depended on patients' disease severity ($p = 0.020$) in a different manner among worker categories (interaction: $p = 0.010$). This time ranged from almost 4 hr up to 6½ hr for the most severely affected patients.

Conclusion: Type of work differed among professionals. Workload greatly depended on degree of patients' disability.

Implications for Nursing Management: Nurses and therapists spent most of their time in direct activities with patients. Economic burden of neurorehabilitation may vary greatly depending on disease severity.

KEYWORDS

rehabilitation, work organisation, workforce issues

*See appendix for authors in Wosa Group.

1 | INTRODUCTION

Information about the amount of time rehabilitation staff spends on various activities is crucial for managing rehabilitation hospitals and optimising clinical work (Urden & Roode, 1997; Wise & Duffield, 2003). Evaluating the appropriateness of staff deployment, number of caring activities received by patients and whether there is any need for job reallocation, staff employment or changes in the model of care delivery can lead to maximising efficiency and productivity (Urden & Roode, 1997). Nevertheless, very few studies have investigated the rehabilitative activities that take up most staff time during the working day. Some of these studies were focused on nursing homes (Munyisia, Yu, & Hailey, 2011) and some on nursing in rehabilitation (Williams, Harris, & Turner-Stokes, 2009), but an overview of the entire rehabilitation staff, i.e. including physical therapists, medical doctors and health care assistants, is still lacking.

Work sampling is commonly used to obtain this information. First developed in the field of industrial engineering (Abdellah & Levine, 1954), the Work Sampling Technique (WST) uses a predefined classification of activities for recording those undertaken at a specific predefined time interval by an independent observer or self-reported by each worker. Even if there is a lack of standardisation in the codification of macrocategories of hospital work (Blay, Duffield, Gallagher, & Roche, 2014; Lopetegui et al., 2014), in most of the studies (Abbey, Chaboyer, & Mitchell, 2012; Capuano, Bokovoy, Halkins, & Hitchings, 2004; Gardner et al., 2010; Williams et al., 2009) this classification included direct activities (those directly performed on patients, such as therapy or medication), indirect activities (such as compiling patients' clinical documentation), unit-related activities (such as daily management of the ward environment) and personal time (such as rest periods or appraisal).

Previous studies carried out using the WST (Chaboyer et al., 2008; Hendrich, Chow, Skierczynski, & Lu, 2008; Munyisia et al., 2011; Wenger et al., 2017; Williams et al., 2009) produced interesting results that varied greatly. An Australian study conducted in two hospitals reported that 47.3% of the nursing staff activities were related to indirect care tasks, 33.2% to direct care tasks, 13.5% to personal time (such as breaks) and that only 6.0% were related to unit-related activities such as meetings (Chaboyer et al., 2008). Different results were obtained in two other Australian studies. Direct care accounted for 36% of how nurses spent their time, indirect care for 32% and service-related activities for 32% in one study (Gardner et al., 2010) and for 41%, 32% and 5%, respectively (adding 22% for personal activities) in the other study (Abbey et al., 2012). Other findings were obtained in a rehabilitation hospital in London, i.e. 51% of the nursing staff work time was dedicated to direct care, 26% to indirect care, 15% to personal time and 8% to unit-related activities (Williams et al., 2009).

The largest study of work sampling in health care (Hendrich et al., 2008) analysed data from 767 nurses across 36 hospitals and found that three activities accounted for most of nursing practice time: documentation management (35.3%), medication administration (17.2%) and care co-ordination (20.6%). A recent Swiss study (Wenger et al., 2017) highlighted the large amount of time spent by medical doctors of an internal medicine hospital on their computers instead of with patients. In this study, indirect activities accounted for 52.4% of medical doctors' working time and activities directly related to patients accounted for only 28.0%, with the time spent on computers about three times that spent with patients.

Very few data have been reported regarding therapists' activities. Surprisingly, one early study (Bergman, 1988) reported that only one-third of their working time was spent treating patients. This evaluation was made by recording the therapists' activities at randomly selected 30 min intervals over a work week.

The above reported large differences among studies could be related to the different health care systems in different countries as well as to the high variability in identifying and defining activities and their relevant categorisation typical of the WST (Blay et al., 2014). Other sources of inconsistency could be due to the presence or not of observers, to the level of training of workers in the correct use of the WST, to the inter-rater reliability of the WST, as well as to the way data were reported and analysed. (Blay et al., 2014).

Despite these criticisms, the WST is still the most common technique for assessing workload (Blay et al., 2014). However, several studies (Bergman, 1988; Williams et al., 2009) used work sampling to analyse activities in a rehabilitation unit. Similar to our study, Jinks and Hope (2000) investigated nurses' activities in a rehabilitation ward using the WST to differentiate between direct and indirect activities and among subcategories of activities. In addition, each one of these studies primarily focused on only one professional group rather than analysing the distribution of activities across all professional categories. Finally, the relationship between workload and patients' severity of disease has been poorly investigated (Kraljic et al., 2017).

Therefore, the WST has been mainly used to investigate the time spent by one working category per study, without providing a generalised overview and without relating the workload to inpatients' severity of disease. Furthermore, the mean percentage of time spent by each professional in a work activity does not indicate the amount of time the patient received direct care, an aspect that could be strictly related to disease severity and that is often taken into account when a rehabilitation budget is made. In fact, it has been reported that longer daily therapy (>3 hr) is associated with higher functional gain (Wang et al., 2013). Despite this, some studies reported patients with less than 1 hr a day of rehabilitation activities (Foley et al., 2012; Karges & Smallfied, 2009).

The first aim of the present study was to analyse the workload of different professionals (i.e. nurses, medical doctors, therapists and health care assistants) in a neurorehabilitation hospital. In line with previous analyses (Williams et al., 2009), activities were categorised as direct care (i.e. when the professional interacts directly with the patient), indirect care (i.e. when the professional works for a specific patient, but not in direct contact with him/her), unit-related activities (pertaining to the normal daily management of the ward environment and its organisation), personal time (including rest periods, education and continuing professional development).

The second aim of this study was to differentiate the workload in relationship to the disease severity of the patients being treated, which was assessed by means of a clinical evaluation of their

independence in the activities of daily living. This independence was clinically assessed using the Barthel Index (BI), a clinical scale that ranges from a score of 0 for total dependence up to 100 for total independence in 10 domains of activities of daily living: feeding, bathing, grooming, dressing, bowels, bladder, toilet use, transfers, mobility and stair climbing (Mahoney, 1965).

Hence, the following two research questions were addressed in this study: (a) Is the type of workload among different categories of health care workers different? (b) Does the workload depend on the level of severity of the patients' disease? We hypothesised that the answers to both of these research questions would be positive.

2 | MATERIAL AND METHODS

2.1 | Design

This research was a self-report observational study conducted using the WST (for a review, see Blay et al., 2014). After specific training focused on the WST, each enrolled worker had to report on a worksheet which activity they were carrying out (Figure 1) at predetermined time intervals (e.g. every 5 min: 7 am, 7:05 am, 7:10 am …). This data collection was carried out for two entire workdays with the aim of calculating the percentage of time they spent performing each activity.

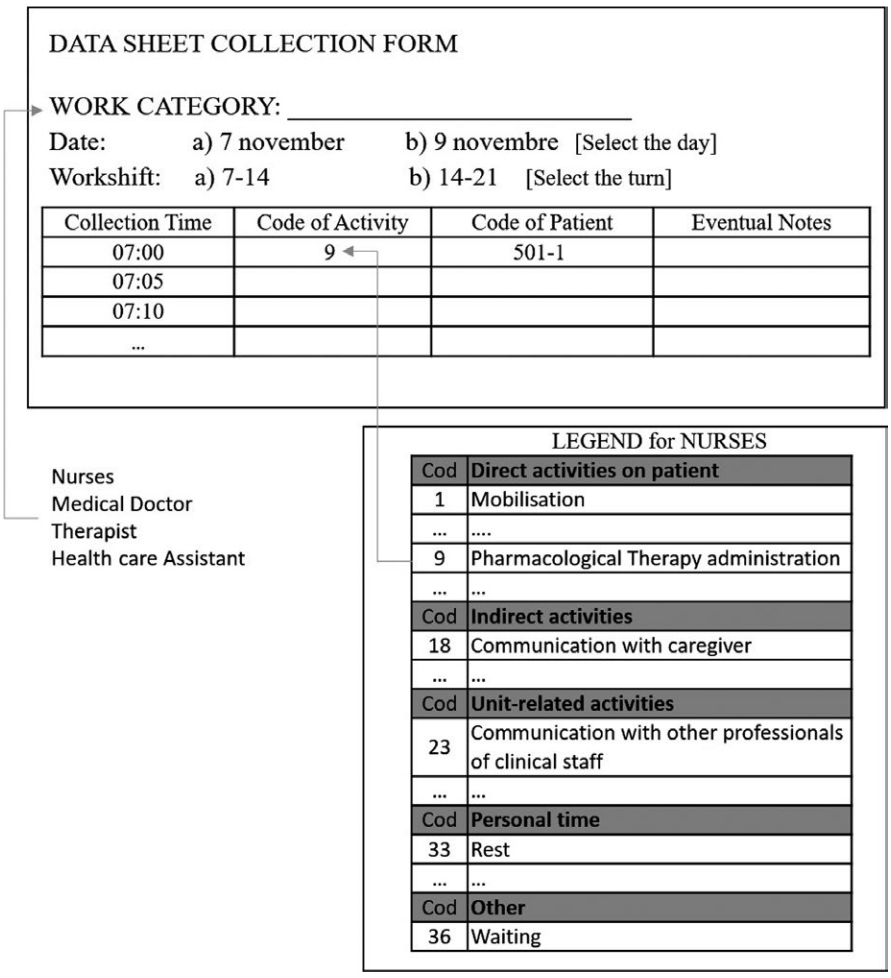
2.2 | Setting

The investigation was carried out in one of the six complex operative units of the Santa Lucia Foundation, a neurorehabilitation hospital in Rome, Italy. The unit has 53 beds.

Santa Lucia Foundation is an IRCCS, i.e. an Italian biomedical institution of national importance. This hospital is highly specialised in neurorehabilitation and is a neuroscience research centre. Although a wide spectrum of illnesses and conditions are treated, rehabilitation therapies are undertaken particularly with patients affected by stroke and coma, spinal cord injuries and amputations and people suffering from degenerative diseases such as Parkinson's disease, Alzheimer's disease and multiple sclerosis.

2.3 | Work activity classification system

The four macrocategories (i.e. direct, indirect, unit-related and personal activities) were selected in accordance with the current literature (Abbey et al., 2012; Capuano et al., 2004; Gardner et al., 2010; Munyisia et al., 2011; Williams et al., 2009). The subcategories were selected on the basis of the literature and were pre-tested by four health professionals of our hospital over 1 day. These activities (reported in Table 1) were specific for each work category (nurses,


DATA SHEET COLLECTION FORM

WORK CATEGORY: _____

Date: a) 7 november b) 9 novembre [Select the day]

Workshift: a) 7-14 b) 14-21 [Select the turn]

Collection Time	Code of Activity	Code of Patient	Eventual Notes
07:00	9	501-1	
07:05			
07:10			
...			

Nurses
Medical Doctor
Therapist
Health care Assistant

LEGEND for NURSES

Cod	Direct activities on patient
1	Mobilisation
...	....
9	Pharmacological Therapy administration
...	...
Cod	**Indirect activities**
18	Communication with caregiver
...	...
Cod	**Unit-related activities**
23	Communication with other professionals of clinical staff
...	...
Cod	**Personal time**
33	Rest
...	...
Cod	**Other**
36	Waiting

FIGURE 1 Representation of the data sheet collection form with the adjunction of codified list of activities

TABLE 1 Activities summarised in the table sheet given to professionals

Category	Type of activity	Involved worker categories (%)				Time (%)
		Nurses	MD	HA	Therapists	
Direct care (activities on patient)	Patient rehabilitative treatment using a specific device	<1	<1	<1	5	1
	Patient rehabilitative treatment (without any specific device)	<1	<1	<1	44	12
	Patient group rehabilitative treatment	<1	<1	<1	2	<1
	Patient positioning, dressing, undressing	7	<1	6	7	6
	Moving patient with the aid of a device	4	<1	3	2	3
	Moving patient without the aid of any device	4	<1	5	3	3
	Patient transportation	<1	<1	14	5	4
	Communication with patients and/or verbal training	3	3	1	1	2
	Nursing care or support to nursing care	7	<1	6	<1	4
	Assisting/supervising meal	2	<1	5	<1	1
	Patient toileting	9	<1	8	<1	5
	Drug administration	14	<1	<1	<1	6
	Management of artificial nutrition	1	<1	<1	<1	<1
	Management of an emergency related to a patient	<1	<1	<1	<1	<1
	Medical visit and/or equipe visit	2	21	<1	<1	4
	Writing and updating individual rehabilitative project	<1	<1	<1	<1	<1
	Medical visit for specialised consultation	<1	<1	<1	<1	<1
Indirect care (activities for, but not on, patient)	Communication to caregiver and his/her verbal training	2	3	1	<1	2
	Writing/updating clinical reports	6	18	<1	5	6
	Multidisciplinary equipe meeting	<1	<1	<1	<1	<1
	Vigilance/Surveillance	<1	10	3	<1	2
	Requests for and reading of internal consultant reports	<1	27	<1	<1	4
	Requests for of aid devices	<1	<1	<1	<1	<1
Unit-related activities	Communication with other professionals	10	11	7	2	8
	Meeting, planning and organisation of work	4	2	1	<1	2
	Modifications to plan	<1	<1	<1	<1	<1
	Co-ordination	4	<1	<1	2	2
	Transportation of clinical documents	<1	<1	4	<1	<1
	Obtaining materials from other wards	3	<1	5	<1	2
	Preparation of drugs, devices and equipment	6	<1	5	<1	4
	Organising and sanitising of therapeutic devices	<1	<1	<1	4	1
	Requests for drugs from pharmacy	<1	<1	<1	<1	<1
	Cleaning, stripping, making beds	3	<1	4	<1	2
	Setting up meals	1	<1	10	<1	2
	Taking out the trash	<1	<1	2	<1	<1
	Sterilisation	<1	<1	<1	<1	<1
Personal time	Meal break	1	<1	<1	8	3
	Break and time owing	2	<1	2	<1	1
	Education and training for self-professional development	<1	<1	<1	6	2
	Time to change in and out of uniform	1	<1	3	2	2
Inactivity	Waiting the end of some other activities	<1	<1	3	2	1

Note. Third column reports the category of worker involved in the activity and the last column reports the percentage of time spent on the activity (independently by work categories).
HA: health care assistants; MD: medical doctors.

medical doctors, therapists and health care assistants). After the pre-test, we added inactivity and activities performed outside the ward by other professionals of the hospital; these latter activities were collected separately by external observers.

2.4 | Participants

All professionals who were working in the neurorehabilitation unit were involved in the study. We enrolled 41 participants on the first day of data collection (i.e. 12 physical therapists, six medical doctors, 17 nurses and six health care assistants) and 40 participants on the second day (i.e. five medical doctors instead of the six enrolled on the first day). All of the clinical staff agreed to participate in the study and signed the informed consent. (Researchers trained all participants about how to compile the data sheet in a 1 hr session.) The main tasks are reported in Table 1. Data collection was carried out over 2 days during which 53 patients were in the unit (two patients were discharged between the first and the second day of the evaluation and two new patients were admitted to the unit; thus, 55 individuals comprised the patient sample). Among the patients, 31 were in the subacute phase of stroke, 14 had multiple sclerosis, five post-coma sequelae, two Parkinson's disease, one Guillain–Barré syndrome, one traumatic brain injury and one had cerebral palsy. Their mean BI score was 38 ± 39 (mean ± standard deviation; median: 21, first quartile: 0, third quartile: 84).

2.5 | Data collection instrument

In agreement with the literature on the WST (Blay et al., 2014; Munyisia et al., 2011; Williams et al., 2009), the collection instrument consisted of a table sheet and a list of 41different activities (reported in Table 1) previously identified as those performed by workers according to state of the art and preliminary interviews with professionals (Munyisia et al., 2011; Williams et al., 2009). On the collection days, each participant was given this schematic table sheet on which the professional could write the type of activity performed at each specific time? Each activity had a code number and the codification list was given together with the table sheet. Timing was reported in the first column, starting from 7 am to 2 pm or from 2 pm to 9 pm with an incremental interval of 5 min, as shown in the exemplificative Figure 1.

2.6 | Training health care workers to use the data collection instrument

Information about the study was given to all personnel of the rehabilitation unit under investigation in the training meetings arranged by the researchers before any actual data collection. The health professionals (physicians, nurses, health care assistants, physiotherapists) were trained to use the WST. Feedback on the instrument from the professionals had previously been taken into account to fine-tune the table sheet adding inactivity and activities out of the ward.

2.7 | Data collection

An independent external entity (a department of LUISS Guido Carli University in collaboration with University of Siena and of Telos Management Consulting) conducted the investigation and supervised the data collection and analysis.

Ten independent supervisors who were expert in using the WST helped the workers correctly compile the table sheets, assured reporting every 5 min and recorded the activities performed by the patients outside of the ward to provide a complete overview of their activities. According to the innovative aim of relating the workload of direct activities and patients' disease severity, we asked the professionals to specify the code of the patients receiving direct activities. To avoid inter-rater bias, the day before the beginning of data collection the Medical Director of the Unit (alone) clinically assessed the level of disease severity of each patient using the BI.

2.8 | Study procedure

The number of observations necessary to obtain a statistically significant meaning of data was computed in line with previous studies (Lwanga & Lemeshow, 1991; Sitting, 2005) using the following formula, i.e. $N = P(1 - P)/s^2$, where N is the total number of needed observations, P is the expected percentage of time required by the most important category of the study and s is the standard deviation of this percentage. In agreement with previous studies, we fixed $p = 0.426$ and $s = 0.010$ (Munyisia et al., 2011) to obtain the number of required observations, i.e. $n = 2{,}436$. With an observation every 5 min, and knowing that the mean working time for professionals is 7 hr per day, the data of 29 different professionals was needed.

2.9 | Ethical considerations

This study was approved by the independent Local Ethical Committee. Participation in the study was voluntary for all professional workers and all agreed to participate.

2.10 | Data analysis

Analysis of variance (reporting F-value with relevant degrees of freedom, p-value and effect size evaluated by means of eta-squared, ES), followed by post-hoc analysis with Tukey's correction, were used to compare the time spent in each of four working categories (direct care, indirect care, unit-ward activities, personal time) by each of the four professional categories represented on the ward (nurses, medical doctors, physiotherapists, health care assistants). Another analysis of variance was performed to compare the amount of direct care received by patients categorised as: severely affected (BI < 25), moderately affected (BI = 25–49), mildly affected (BI = 50–75) and slightly affected (BI > 75). To avoid bias due to the different number of professionals for each category and/or to the different number of patients for each group, we have performed a standardisation: for the former

analysing the percentage of time spent by each professional on each patient. In addition, for the total amount of time spent on patients, we standardised our results using average patient for each group.

Descriptive (not inferential) statistics were applied to meal breaks (because they took place outside of work time?), workers' inactivity (because not all categories reported inactivity, which was defined as waiting for the end of another professional's work to start one's own work), and data collected by observers regarding the activities performed outside the ward by other professionals (such as therapists specialised in hydrokinetic therapy, occupational and speech therapy, phoniatric and pulmonary rehabilitation, dysphagia treatment or neuropsychologists treating cognitive deficits).

3 | RESULTS

There were 6,974 observations distributed over 581 working hours. The number of observations was 2.8 times higher than the minimum number required to obtain a significant result detected by sample-size computational power analysis. There were 41 datasheets the first day and 40 the second day. The mean number of observations for each professional was 86.1, covering about 7.2 working hours. There were no significant differences among worker categories and very high compliance was found for use of the data collection instrument.

The most common activities of the ward workers are shown in the last column of Table 1. They include physical therapy (11.87% performed only by therapists), communication among workers (7.56%), indirect care related to writing and updating clinical documentation (6.35%), drug administration (6.12% only performed by nurses), mobilising and dressing the patient (5.80%) and patient's hygiene care (5.05%).

For each professional category, Table 2 shows the repartition of observations for direct activities on patients, indirect activities, unit-related activities and personal time. Time spent in each macrocategory was significantly different among working categories for direct activities, indirect activities and unit-related activities, but not for personal time.

Physical therapists and nurses spent most of their time in direct care (75.2% and 54.8%, respectively). Conversely, medical doctors spent only 25.4% of their time in direct care and most of their time in indirect care (almost 60%). They spent less time with patients than nurses and therapists (see post-hoc analyses) and more time in indirect care than all other professional categories. Health care assistants mainly divided their time between direct care (47.5%) and unit-related activities (40.6%, see Tables 1–31–3). The relatively high percentage of personal time found for therapists was due to the fact that during data collection two of them were involved in an educational course for part of their working time.

Inactivity, corresponding to forced waiting at the end of the activity of another worker, was not reported in Table 1 because none of the medical doctors reported waiting between their activities (thus making an analysis of variance meaningless). Furthermore, other professionals also reported little inactive time: on average 1 min for each nurse; 6 min for therapists; and 14 min for health care assistants.

Figure 2 shows the time spent in direct activities with patients by each working category, divided according to patients' disease

TABLE 2 Time (minutes per each work day) spent in each type of activity for the four health care worker categories (average worker) and the relevant percentages (100% corresponds to the entire work day for a specific average worker)

Activity	Direct activities	Indirect activities	Unit-related activities	Personal time
Worker category				
Nurses	246 min 54.8%	42 min 9.3%	144 min 32.2%	16 min 3.5%
MD	111 min 25.4%	259 min 59.4%	63 min 14.5%	3 min 0.7%
Therapists	276 min 75.2%	21 min 5.7%	31 min 8.4%	33 min 9.0%
HA	199 min 47.5%	16 min 3.9%	170 min 40.6%	19 min 4.7%
F *p*-values ES	$F(3,63) = 6.99$ $p < 0.001$ ES = 0.250	$F(3,57) = 50.28$ $p < 0.001$ ES = 0.725	$F(3,62) = 14.45$ $p < 0.001$ ES = 0.411	$F(3,49) = 0.622$ $p = 0.604$ ES = 0.040
Post-hoc analyses				
Post-hoc tests				
Nurses–MD	**<0.001**	**<0.001**	**0.021**	NS
Nurses–therapists	0.944	0.341	**<0.001**	NS
Nurses–HA	0.450	0.999	0.276	NS
MD–therapists	**0.002**	**<0.001**	0.679	NS
MD–HA	0.063	**<0.001**	**0.001**	NS
Therapists–HA	0.759	0.711	**<0.001**	NS

Note. ES: effect size; *F*: degrees of freedom; HA: health care assistant; MD: medical doctor; NS: not significant.
Results of analysis of variance (*F* and relevant degrees of freedom, *p*-values, ES) and relevant post-hoc tests were also reported (*p*-values are reported in bold if statistically significant). Post-hoc tests were not performed if no significant results were found in the relevant analysis of variance.

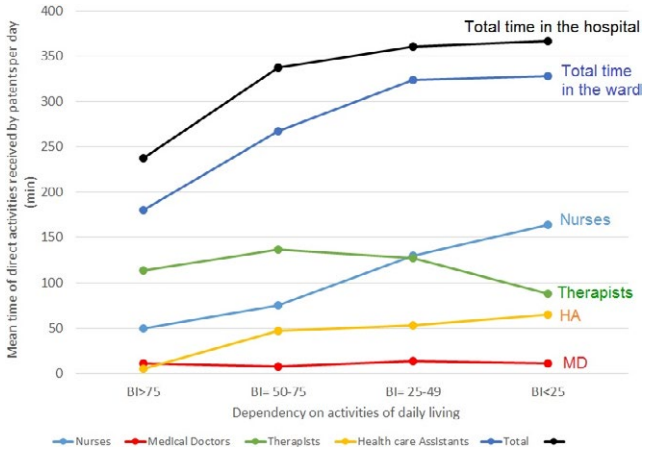


FIGURE 2 Average time in minutes spent in direct activities by each worker category per each level of dependency in activities of daily living of patients. Total time in the ward is given by the sum of the four worker categories, whereas the total time in the hospital also includes the activities performed by patients out of the ward. BI: Barthel Index; HA: health care assistants; MD: medical doctors. [Colour figure can be viewed at wileyonlinelibrary.com]

severity. Significant effects on time spent in direct activities were found for level of patients' autonomy ($F_{(3,189)} = 3.37$, $p = 0.020$, ES = 0.05), working category ($F_{(3,63)} = 5.68$, $p = 0.001$, ES = 0.21) and for the interaction between these two factors ($F_{(9,189)} = 2.50$, $p = 0.010$, ES = 0.11).

The average number of hours of activities performed on patients ranged from almost 4 hr for patients with BI scores higher than 75 to 6.5 hr for patients with BI scores <25. Some activities were specific for a particular category of patients, such as artificial nutrition or intervention for an emergency performed on the most severely affected patients (Table 3), or interventions such as hydrokinetic therapy performed only on patients with BI score >50. Hydrokinetic therapy was administered in the hospital swimming pool by specialised therapists, whereas neurocognitive treatment was administered by neuropsychologists, and speech treatment by logopedic therapists. All of these activities were performed outside of the neurorehabilitation unit by other professionals and did not enter the analyses of the ward workers. At night, there were four nurses of the unit and two medical doctors for all 6 units (0.33 of equivalent full time). Table 3 shows that surveillance was divided equally among patients.

4 | DISCUSSION

The main aim of the present study was to analyse the workload of professionals working in a neurorehabilitation hospital. With respect to this goal, this study has several novel aspects, such as the analysis of different worker categories and the relationship between times spent in direct activities and level of patients' autonomy.

The first result is the high variability among different working categories regarding the type of work carried out, with nurses, therapists and health care assistants spending most of their time in direct activities, and medical doctors in indirect ones. Indirect activities were those related to writing and updating clinical documentation and requesting and reading internal consultant reports. The greater amount of time spent by medical doctors in indirect care rather than in direct care of patients has already been pointed out in a recent Swiss study (Wenger et al., 2017). On the other hand, it has been highlighted that documentation is not only a professional requirement but also a necessity for maintaining quality of care (Crofton & Witney, 2004). The quantity of needed documentation may depend on the hospital's documentation policy and on health-related laws, which are closely related. We observed that compiling clinical documentation also takes up a large part of the nurses' time (6.35%), which has also been reported in previous studies (Munyisia et al., 2011).

Another common activity found in our results is communication. Munyisia et al., 2011 found that communication with patients and co-workers was the most time-consuming activity of the nursing staff. We also found that communication takes up a great deal of time. In our study, this activity was divided between communication with co-workers (7.56%, unit-related activity), patients (2.14%, direct activity) and caregivers (1.51%, indirect activity).

The most innovative result of our study, which was related to our second aim, was that the activity load varied across patients with different levels of autonomy. It is conceivable that patients with more severe disabilities need more caring activities; however, this is the first study in which the workload was measured in relation to the clinical severity of patients with neurological disorders. We found that the total average time spent with these patients ranged from almost 4 hr for patients with BI scores higher than 75 up to 6 hr and 31 min for patients with BI scores lower than 25. The former patients were probably those who were near discharge because their rehabilitative path was almost finished, whereas the latter were those recently admitted to the hospital.

Particularly interesting is that the time spent in direct activities for nurses and health care assistants increased with the level of disease severity, for medical doctors it was quite constant, and for therapists it was higher for medium levels of disability. This can be explained by the fact that patients with higher disease severity often have complications, such as pain, fever, etc. (Buffel du Vaure et al., 2016), reducing the time in which it is possible to carry out intensive rehabilitation (or, for example, interventions such as hydrokinetic therapy) and at the same time increasing the caring needs and hence the nurses' workload (Kraljic et al., 2017). Conversely, patients with a high level of autonomy, who are close to discharge, may need less assistance during rehabilitation.

Our study has some limitations. First, although self-reporting can capture the tasks being performed, the accuracy of reporting suffers due to subjectivity of perceptions and recall error, as well as lapses during rush hours (Ampt, Westbrook, Creswick, & Mallock, 2007), which may break down the natural flow of activities, potentially altering the natural unperturbed flow. Another limitation is that our study was conducted in a single Italian hospital specialised in neurorehabilitation and this may limit the generalizability of our findings. The

TABLE 3 Mean number of minutes (or hours and minutes) spent in direct care activities by workers

Direct activities on patient	Worker category	Severity of disease			
		BI > 75	BI: 50–75	BI: 25–49	BI < 25
Patient's rehabilitative treatment (without using any specific device)	Nurses	0.0	0.0	0.0	0.0
	MD	0.0	0.0	0.0	0.0
	HA	0.0	0.0	0.0	0.0
	Therapists	85.9	103.3	56.7	53.0
	Total	85.9	103.3	56.7	53.0
Patient's positioning, dressing, undressing	Nurses	6.3	5.0	22.2	27.0
	MD	0.0	0.0	0.0	0.0
	HA	0.0	8.3	5.6	9.7
	Therapists	7.8	13.3	6.7	13.8
	Total	14.1	26.7	34.4	50.5
Patient's toileting	Nurses	7.0	0.0	20.0	36.3
	MD	0.0	0.0	0.0	0.0
	HA	0.7	6.7	14.4	11.5
	Therapists	0.0	0.0	0.0	0.0
	Total	7.8	6.7	34.4	47.8
Drug administration	Nurses	21.5	26.7	32.2	33.3
	MD	0.0	0.0	0.0	0.0
	HA	0.0	0.0	0.0	0.0
	Therapists	0.0	0.0	0.0	0.0
	Total	21.5	26.7	32.2	33.3
Nursing care	Nurses	3.0	0.0	17.8	22.8
	MD	0.0	0.0	0.0	0.0
	HA	0.0	0.0	3.3	5.8
	Therapists	0.0	0.0	0.0	0.0
	Total	3.0	0.0	21.1	28.7
Patient transportation	Nurses	0.0	0.0	0.0	1.2
	MD	0.0	0.0	0.0	0.0
	HA	3.0	25.0	13.3	17.8
	Therapists	7.8	1.7	18.9	7.8
	Total	10.7	26.7	32.2	26.8
Management of artificial nutrition	Nurses	0.0	0.0	0.0	5.0
	MD	0.0	0.0	0.0	0.0
	HA	0.0	0.0	0.0	0.0
	Therapists	0.0	0.0	0.0	0.0
	Total	0.0	0.0	0.0	5.0
Emergency	Nurses	0.0	0.0	0.0	1.5
	MD	0.0	0.0	0.0	1.0
	HA	0.0	0.0	0.0	0.3
	Therapists	0.0	0.0	0.0	0.0
	Total	0.0	0.0	0.0	2.8
Moving patient without the aid of any device	Nurses	0.4	23.3	25.6	10.5
	MD	0.0	0.0	0.0	0.0
	HA	0.0	1.7	12.2	7.5
	Therapists	0.7	13.3	12.2	3.0
	Total	1.1	38.3	50.0	21.0

(Continues)

TABLE 3 (Continued)

Direct activities on patient	Worker category	Severity of disease			
		BI > 75	BI: 50–75	BI: 25–49	BI < 25
Moving patient with the aid of a device	Nurses	3.0	3.3	2.2	16.3
	MD	0.0	0.0	0.0	0.0
	HA	0.0	0.0	3.3	5.7
	Therapists	3.0	3.3	3.3	3.2
	Total	13.0	18.3	18.9	13.8
Medical visit and/or equipe visit	Nurses	5.2	10.0	5.6	4.5
	MD	7.8	8.3	13.3	9.3
	HA	0.0	0.0	0.0	0.0
	Therapists	0.0	0.0	0.0	0.0
	Total	13.0	18.3	18.9	13.8
Assisting/supervising meal	Nurses	2.6	0.0	0.0	2.7
	MD	0.0	0.0	0.0	0.0
	HA	1.5	3.3	0.0	6.2
	Therapists	0.0	0.0	0.0	0.0
	Total	4.1	3.3	0.0	8.8
Patient's rehabilitative treatment (with a specific device)	Nurses	0.0	0.0	0.0	0.0
	MD	0.0	0.0	0.0	0.0
	HA	0.0	0.0	0.0	0.0
	Therapists	6.7	1.7	17.8	6.3
	Total	6.7	1.7	17.8	6.3
Communication with patient and verbal training	Nurses	1.5	6.7	4.4	3.2
	MD	3.0	0.0	1.1	1.0
	HA	0.0	1.7	1.1	0.8
	Therapists	2.6	0.0	11.1	1.0
	Total	7.0	8.3	17.8	6.0
Medical visit for specialised consultation	Others	32.8	40.0	0.0	0.0
Neurocognitive rehabilitation	Others	22.5	0.0	36.0	25.5
Respiratory therapy	Others	0.0	0.0	0.0	2.5
Speech and occupational therapy	Others	0.0	26.7	16.0	21.4
Hydrokinetic therapy	Others	1.9	30.0	0.0	12.9
Total daily activities	Nurses	50.4	75.0	130.0	164.3
	MD	10.7	8.3	14.4	11.3
	HA	5.2	46.7	53.3	65.3
	Therapists	114.4	136.7	126.7	88.2
	Others	57.2	96.7	52.0	62.2
	Total	3 hr 58 min	6 hr 3 min	6 hr 16 min	6 hr 31 min
Night surveillance	Nurses	47.1	47.1	47.1	47.1
	MD	4.7	4.7	4.7	4.7
	Total	51.8	51.8	51.8	51.8
Total 24 hr		4 hr 50 min	6 hr 55 min	7 hr 8 min	7 hr 23 min

Note. BI: Barthel Index; HA: health care assistants; MD: medical doctors; Others: other professionals working in a central service of the complex operative unit) in relation to patients' autonomy (the lower the BI, the higher the disease severity).

study was also confined to 2-day shifts (including both morning and afternoon). Another limitation of this study concerns the possibility that during the self-reported work sampling some activities were reported later because the staff member was too busy at the time, and this may have introduced memory-related biases. These limitations are analogous to those found in other similar studies (Chaboyer

et al., 2008; Munyisia et al., 2011) and summarised in Blay et al. (2014) review. The activity records were prepared by the workers under the supervision of experts in the WST. Multi-tasked activities and activities performed at the same time, such as therapy and communication of therapy aims, were recorded as just one activity, i.e. the one considered most important; thus, the personal judgement of each worker may have generated another bias. However, all these limitations are intrinsic to the use of the WST and common to all other studies on workload measures carried out in clinical settings. To avoid a methodological bias, we just reported the description of the activities performed out of the ward, but we did not inferentially analyse them because they were collected by the observers. Most of the analyses were performed on macrocategories, in line with the aims of our study and with most of the current literature, also because in many cases specific activities are related to only one working category. The activity of education might be common to all workers, but on data collection days only two therapists were involved in this activity. They could be considered as outliers, but we preferred to keep them in the analysis to highlight that continuous education is a fundamental activity in medicine.

5 | CONCLUSIONS AND IMPLICATIONS FOR NURSING MANAGEMENT

In conclusion, this study provides useful information about how clinical staff spends its time in a rehabilitation hospital. The same approach could also be useful in other clinical settings and in other hospitals to evaluate objectively the workload and hence work organisation.

Patients' disease severity is a key factor to consider in clinical management (Buffel du Vaure et al., 2016). It mainly affects the work of nurses and health care assistants and is also related to interventions of medical doctors, particularly for emergencies. Our results show that therapists perform more activities on patients with a medium level of disease severity. In addition, the type of activities performed outside the ward, such as hydrokinetic therapies, depend greatly on disease severity. This also involves the time spent in transporting patients outside of the unit. It should also be noted that patients' disease severity changes during the rehabilitation path, thus modifying their needs day-by-day and hence the workload of clinical workers and the need for collaboration among different professionals. Further studies should provide more information about this collaboration between professionals.

An analysis of workload performed in a structured manner using the WST is important not only because it can help improve hospital policy (Urden & Roode, 1997; Wise & Duffield, 2003), but also because it can help politicians to assess the economic burden of neurorehabilitation, which needs to be differentiated according to disease severity.

ETHICAL APPROVAL

CE/PROG.545-2016, 'A work sample for a simple work'.

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APPENDIX

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