

REVIEW

Review of dietetic service provision and activity in spinal cord injury centres: a multicentre survey in the UK and Republic of Ireland

This article has been corrected since advance online publication and a corrigendum is also printed in this issue.

S Wong^{1,2,3}, A Graham¹, SP Hirani², D Charlton¹, S Coalwood¹, E McKeown², C Taylor⁴ and M Saif¹

Objectives: The present study was undertaken to review the service provision in spinal cord injury (SCI) centres (SCICs); to establish and compare how much time dietitians spend in direct and indirect contact with patients; and to document current nutritional screening practices.

Methods: All 12 SCICs in the United Kingdom and the Republic of Ireland were surveyed by a postal questionnaire in April 2014. Data collected included the number of whole-time-equivalent (WTE) staff available, whether a nutrition team was present and the use of nutrition screening tools. A work sampling tool was used to capture dietetic activity for a period of 1 week.

Results: Eight (66.7%) SCICs responded (390/531 of total SCI beds) and the average numbers of patients per WTE staff, including consultants, nurses, dietitians, physiotherapists, occupational therapists were recorded. Six out of eight SCICs used a validated nutritional screening tool. Thirty-two work sampling tools were analysed, revealing that spinal dietitians spend 39.1% of the working day in direct patient-related activities. Staffing levels varied and were below clinical recommendations in six out of eight SCICs.

Conclusion: The resources allocated to nutritional care in SCICs appear to be varied and limited. This suggests malnutrition may continue to be under-recognised and under-treated. To address the complex nutritional needs of this special population group there is a clear need to establish staffing level for dietitians. Information collected from the present study could contribute to the supply analysis of a future workforce planning exercise in SCIC dietetic service.

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INTRODUCTION

Workforce planning is an essential component of guaranteeing that the hospitals organisational objectives are met by ensuring that 'the right number of people, with the right skills, in the right place at the right time' are present to deliver them¹. This is against the current pressure of cost containment, reform and sustainability of current levels of health and social care services.²

The literature suggests that a multifaceted approach, including staff ratio allocation, time and motion study or work sampling methods, should be used by health and social care professionals to determine current staff and activity levels.^{3–5} To date, there is a reported 'lack of basic and accurate information necessary to inform comprehensive workforce modelling supply'^{6,7} and as, a report commissioned by the Scottish Executive⁸ highlighted, there is a need for 'real time workforce data that is consistent, evidenced, relevant and meaningful'.

In dietetics, there is limited published evidence related to workforce measurement, staffing levels and activity^{3,6,7,9,10}, and to date, there is no spinal cord injury (SCI) centre (SCIC) specific information available reporting dietetic workforce activity.

The specialised SCIC not only provides care following SCI, which usually lasts many months but also provides life-long care for patients

living with SCI whose medical needs differ significantly from those of the general population. For people with no sensation below the level of injury, the body learns to function in different ways, conditions such as pressure ulcers can go undiagnosed, and complications which would not be serious for another patient can become life-threatening. The SCICs therefore aim to provide an extensive range of medical and allied health services, and not only those which are obviously related to paralysis. Indeed, previous literature reported staffing issues including nursing, and allied health professionals was an issue in the UK, Australia and Italian SCICs.¹¹

The present study aimed to: (1) review current clinical workforce allocation and compare it with recommended previous literature and professional standards^{6,12,13}; (2) document dietetic time spent in direct patient care and activities that contribute to patient care; (3) report nutritional practice and management in the United Kingdom and Republic of Ireland SCI centres.

MATERIALS AND METHODS

A cross-sectional investigation of dietician practices was undertaken using a self-reported measurement tool. A questionnaire was developed by the Principal Investigator (SW) based on clinical expertise and previous

¹Department of Nutrition and Dietetics, National Spinal Injuries Centre, Stoke Mandeville Hospital, Aylesbury, UK; ²Health Service Management Division, School of Health Sciences, City University London, London, UK; ³Institute for Liver and Digestive Health, University College London, London, UK and ⁴Department of Nutrition and Dietetics, Princess Royal Spinal Injuries Centre, Northern General Hospital, Sheffield, UK
Correspondence: S Wong, Department of Nutrition and Dietetics, National Spinal Injuries Centre, Stoke Mandeville Hospital, Mandeville Road, Aylesbury UKHP21 8AL, UK.
E-mail: Samford.Wong@buckshealthcare.nhs.uk

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literature^{6,7} and was modified further by a team of multi-disciplinary professional working in SCICs.

The questionnaire consisted of three parts. The first was designed to capture baseline demographic data and workforce characteristics of SCICs. A spokesman for each SCIC was asked to provide the number of available SCI beds and the number of whole-time-equivalent (WTE) levels of clinical staff (Supplementary Appendix 1, 2 and 3). The second part focused on the dietitian's practice, staff grade and nutrition-screening practice and; the third part focused on a 'time and motion' study of dietitians. A tool was devised using an Excel spreadsheet (Microsoft Corp, Redmond, WA, USA) to capture this information. The timeframe for the working data started at 0730 hours and ended at 1900 hours. The time period was divided into 15 min slots. To save time and make it easier to record and process in the analysis stage, a series of codes were devised to reflect different work tasks that were recorded locally (Supplementary Appendix). Before the launch of the study, all local investigators attended a meeting and received training on how to complete the questionnaire (Supplementary Appendix: Supplementary Information).

The tool was piloted within the dietetic department of the Principal Investigator's institution over a 1-week period, aiming to determine whether information collected would reflect current work practices and to highlight any reporting issues that may arise. The tool was then discussed with other collaborators via email and a consensus was agreed on as to which activity codes would constitute direct and indirect care. It was agreed that each centre's dietitians would be required to complete the tool for 1 week.

Survey administration

The survey was sent to all dietitians working in the United Kingdom and Republic of Ireland SCICs (Republic of Ireland: $n=1$ centre and the United Kingdom: $n=11$ centres) between April 2014 and June 2014. Participants were

reassured that all findings would be treated anonymously and in confidence to encourage respondents to answer honestly. Completed questionnaires were anonymised prior to analysis. Two reminders were sent (one at 4 weeks and one 8 weeks after the initial survey distribution).

The data collected were received either via email or post. The results from the questionnaires were processed in an Excel spreadsheet to provide descriptive information on the centres that participated. Data from the work sampling tools were transferred into Excel spreadsheet for analysis. Descriptive statistics were used to identify the proportion of the working day spent on each activity.

Ethics

Formal ethical opinion to conduct the study was not required as this was considered to be a clinical audit not involving active patient participation¹⁴. The questionnaires were approved by the local clinical audit departments at the participating SCICs for phrasing and grammar of the questions.

Statistical analysis

Descriptive statistics were used to calculate the response frequency. Data are reported as mean (s.d.) or median (range).

The workforce data were compared between SCICs and previous published figures⁶. Dietitian time spent on patient care and other related activities were compared between SCICs and by staff grade. For numeric data on an ordinal level, the Mann-Whitney test was used. The data was analysed using Minitab version 15 (Minitab Ltd, Coventry, UK) and significance was accepted if $P<0.05$.

RESULTS

Medical and dietetic staff from 12 SCICs were approached (11 in the United Kingdom and 1 in the Republic of Ireland), 8 (66.7%)

Table 1 Workforce distribution in UK & Ireland SCI centres

	Centre 1	Centre 2	Centre 3	Centre 4	Centre 5	Centre 6	Centre 7	National average	National standard ^a
<i>Staff group (beds per WTE)</i>									
Consultants	31	22.5	15.3	17	22	23	16	20.3	15–20
Doctors in training	6.2	12	46	8.5	22	10.5	12	16.7	Nil set
Nurses	—	1.4	1.39	1.54	0.64	1.29	0.5	1.1	2–3
Dietitians	124	60	153	56	146	65	160	99.5	60
Physiotherapists	6.9	6	4.0	4.0	5.5	4.9	8.0	5.6	5–7
Occupation therapists	12.9	10	5.7	3.7	11	7.8	8.9	8.6	6–8

Abbreviation: WTE, whole time equivalent.

^aJoint Standard Development Groups of the South of England Review Group¹².

Table 2 Nutrition practice and management in UK & Eire SCI centres

	Centre 1	Centre 2	Centre 3	Centre 4	Centre 5	Centre 6	Centre 7	Centre 8	Average
Pay band	7	8	6	7	6	5/7/8	7	6	—
% direct patients activity	16.6	29.9	44.7	47.5	39.7	31–38	—	—	39.1
% indirect patient activity	83.4	70.1	55.3	52.5	60.3	62–69	—	—	60.9
Number of patients under dietitian care	20–30	24	20–30	14	20	35	—	10 (24 beds)	—
% of total beds	40	66.7	34	82	45.5	30.4	—	41.6%	51.3
Nutrition screening on admission	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	88.8%
Nutrition screening tool	MUST	SNST	SNST	Local tool	Local tool	SNST	MUST	MUST	66.7 use validated tool
<i>Time frame to complete nutrition screening</i>									
Within 24 h	—	—	x	x	x	x	x	x	71.4%
Within 48 h	x	x	—	—	—	—	—	—	28.6%
Number of study leave in last 12 months	0	0.5	20	0	2	8	—	1	3.5
Uniform	Yes	No	No	Yes	Yes	No	Yes	Yes	55.6%
Weekend work	No	No	No	No	No	No	No	No	—

Abbreviations: MUST, Malnutrition Universal Screening Tool; SCI, spinal cord injury; SNST, Spinal Nutrition Screening Tool; X, indicating their choice.

Table 3 Human resources allocation in participating SCICs

Staff category	Total WTE Staff	Number of beds per WTE staff Mean (s.d.)—range	2009 figures ⁶ number of beds per WTE staff ^a	P-value	National recommendations ^{6,12,13}
Consultants (<i>n</i> = 7 SCICs)	18.0	20.3 (5.5) (15.3–31)	14.9 (4.3) (10.5–24.4)	0.153	15–20
Other grades of medical staff	33.0	16.7 (13.8) (6.2–46)	10.1 (3.6) (7.5–20.0)	0.701	—
Nurses (<i>n</i> = 6 SCICs)	325.7	1.1 (0.5) (0.5–1.54)	1.0 (0.5) (0.6–1.8)	0.748	2–3
Dietitians (<i>n</i> = 7 SCICs)	4.63	99.5 (51.2) (34–160)	108.4 (101.7) (30–387)	0.272	—
Physiotherapists (<i>n</i> = 7 SCICs)	65.49	5.4 (1.4) (4–8)	5.8 (2.0) (3.75–10.5)	0.848	5–7
Occupation therapist (<i>n</i> = 7 SCICs)	—	8.6 (2.9) (3.7–12.9)	9.1 (4.0) (3–16.6)	0.617	6–8

Abbreviations: SCIC, spinal cord injury centre; WTE, whole time equivalent.

^aBased on 11 SCI centres in the UK (*n* = 10) and Ireland (*n* = 1).

respondents (7 in the UK and 1 in the Republic of Ireland) completed and returned the questionnaire (Tables 1 and 2). The centres represented 390 of 531 (73.4%) UK and Ireland SCI beds (1 SCIC in the Republic of Ireland (*n* = 36) and 7 SCICs in the United Kingdom (*n* = 354); Table 2).

For the 390 allocated beds, the mean numbers of beds per WTE staff (s.d.) were as follows: consultants: 20.3 (5.5); nurses: 1.1 (0.5); dietitians: 99.5 (51.2); physiotherapists: 5.4 (1.4); occupational therapists: 8.6 (2.9). The number of beds–staff ratio in SCICs were summarised in Table 2, when compared with the previously reported figures⁶ using Mann–Whitney test. There were no statistical significant changes in different staff groups (Table 3).

Numbers in WTE and grade of dietitians are summarised in Tables 2 and 3. The number of dietetic staff in SCICs ranged from 34 to 160 beds to a WTE dietitian.

Nutrition practice in SCICs

All SCICs reported that they used a nutritional screening tool. Six of eight SCICs (75%) used a validated nutrition screening tool (*n* = 3: Malnutrition Universal Screening Tool¹⁵; *n* = 3: Spinal Nutrition Screening Tool¹⁶ and the remainder (*n* = 2) used a local unvalidated tool). Six of eight (75%) SCICs reported they aim to complete nutritional screening within 24 h of admission and two of eight SCICs (25%) aim to complete nutritional screening within 48 h. The number of patients under dietitian care ranged from 30.4 to 82% of the allocated SCIC's beds. None of the SCICs provided dietetic cover during the weekend and five of eight SCICs dietitians in SCICs wore a uniform.

Work sampling tool results

There were a total of 32 work sampling questionnaires (from 8 SCICs) completed and returned for analysis.

The median time reported in direct face-to-face contact with patients was reported to be 12.2% of the working day (Table 4). Assessing patients was the second highest activity recorded for direct care. The median time spent was 6.7% of the day. Monitoring patients was the third highest activity reported, contributing 5.9% of time, followed by liaison with health professionals (4.0%). In total, direct patient activities contributed to 39.1% of the working day in total.

In total, 60.9% of the working day was spent on indirect activities. Most of the time (11.9%) was spent on patient's administration such as writing reports or letters for patients. Other tasks such as e-mail, work prioritization or planning for meetings contribute to general administration, which take up to 11.2% of the working day. Clinical audit takes up to 6.6% and clinical supervision and team meetings are reported at almost 3–4%.

DISCUSSION

The present study found that each WTE consultant covers 18 SCI beds, and they now need to cover three more patients when compared with previous published figures (15 SCI beds)⁶, although this was a non-significant increase (*P* = 0.153). Nursing and other allied health workforces were stable and in line with national recommendations¹² (Table 1).

At the present time, no formal recommendation has been set by the specialist commissioners¹³ for optimal staffing level for dietitians. The present audit found that the provision of dietitians did not significantly improve in the last 5 years (Table 1). The number of staff in different SCICs still varied considerably (34 to 160 beds per WTE dietitian). This is comparable to the findings reported in other clinical specialties such as paediatrics,⁷ critical care,⁹ and thermal injury.¹⁰

Only three of eight (37.5%) SCICs meet the recommended dietitian to bed ratio 1:60 set by the SCI dietitians group of the British Dietetic Association (BDA)⁶. In addition, dietitians in five of eight (62.5%) SCICs still report covering >100 patients per WTE. A study by Windle⁹ found that the allocation for dietitians in the adult intensive care unit was also under resourced. Indeed, low staffing level issues were also highlighted in recent international SCICs survey.¹¹ The variation in staff levels could be due to each SCIC having its own unique needs and challenges and therefore comparisons do have limitations (especially over a small sample of centres). However the impact remains; recent literature suggests malnutrition, including both under- and over-nutrition (obesity) is common in patients with SCI and it is associated with poorer clinical outcomes and increased healthcare costs¹⁷. Recently, health commissioners' recognised the unique and important role of dietitians and support the inclusion of dietitians in the core multidisciplinary team for SCI care.¹³ However, the inconsistencies and inadequacies in dietetic provision suggest malnutrition will continue to go under-recognised and under-treated.

The median time spent in direct face-to-face contact was 12.2% (range: 5.1–22.7%) of the working day. This is comparable with other studies in medicine and nursing reporting that less than one-fifth of the working day is spent via direct face-to-face contact.^{18,19}

In the present study, the amount of all direct patient contact totalled to 39.1% of the dietitians' time. Health professional liaison, multi-disciplinary team meetings and education were included in direct activity (4.9%). Indeed, spinal dietitians are required to communicate with other professionals and carers to formulate and deliver nutritional care plans for patients. Therefore we would count these activities as direct patient contact, however, communication-related activities were classified as indirect contact in previous research.¹⁹ Consensus was agreed prior to data collection by all participants.

This study reported that 39.1% of working time is spent on direct patient's activity. If we take account of patient's administration, such

Table 4 Proportion of the working day (%) spent in direct and indirect patient activity by staff grade

Activity	Band 5 (n = 1)	Band 6 (n = 2)	Band 7 (n = 3)	Band 8a (n = 1)	Median (range)
<i>Direct activity</i>					
Patient	15.2	16.3	11.1	6.5	12.2 (5.1–22.7)
Assessment	10.9	4.4	5.7	6.5	6.7 (0.7–10.9)
Monitoring	6.7	5.1	10.1	3.8	5.9 (0–19.0)
Calculations	2.4	3.8	1.4	0.9	1.0 (0–6.4)
Education	1.4	1.7	0.3	5.7	0.55 (0–5.7)
HP liaison	1.8	4.3	5.2	6.5	4.0 (0–11.9)
MDT meeting	0.0	6.0	2.2	0.0	0.35 (0–8.5)
OP telephone	0.0	0.9	0.0	0.0	0.0 (0–1.7)
Sub-total	38.4	42.5	36.0	29.9	39.1 (16.6–48.3)
<i>Indirect activity</i>					
Patient administration	7.9	19.8	9.4	10.3	9.6 (1.4–23.8)
Catering	1.2	0.3	2.2	2.8	1.3 (0–4.9)
Clinical administration	3.7	1.2	2.4	7.5	2.4 (0–7.5)
Resource development	3.7	3.2	1.9	0	0.0 (0–7.5)
Audit	15.9	7.5	3.5	7.5	7.1 (0.0–15.9)
Research	0.0	0.0	8.5	0	0.0 (0–33.5)
General administration	7.3	11.5	11.2	16.8	13.8 (2.4–19.3)
Team meeting	5.5	0.3	2.4	6.5	1 (0–8.2)
Clinical supervision	3.0	4.3	6.1	0	1.9 (0–18.9)
CPD	4.3	0.0	1.4	5.6	0.0 (0–5.7)
Training	0.0	0.0	0.6	5.6	0.0 (0–5.6)
Break	7.9	6.8	11.8	5.6	7.4 (2.9–20.7)
Study leave	0.0	0.6	0.0	0.0	0.0 (0–1.1)
One to one	1.2	2.0	2.6	1.9	1.6 (0–8.5)
Sub-total	61.6	57.5	64.0	70.1	60.1 (51.7–83.4)

Abbreviations: CPD, continue profession development; HP, health-profession; MDT, multidisciplinary team; OP, out-patient.

as writing clinical letters as direct patient activity, the adjusted total direct patient activity will be 49.1%. This is still low when compared with literature reporting paediatric dietitian (58.9% on direct patient's activity)⁷ and the BDA that 75% of dietetic time is spent in actual direct patient contact¹⁹. Therefore, the BDA recommendation (75%) may not accurately reflect the proportion of time dietitians spend on indirect patient contact, nor indeed any other professionals. Further research on what constitutes direct activity is required to ensure that different studies are comparable and classify work in the same manner. The present study found that dietitians with a senior grade spend less time in direct patient contact when compared with those of a junior grade (Table 4). This may be a result of inexperience in the junior grades (who may take longer to complete a nutrition assessment) and senior staff spending more time in additional roles such as involvement in discharge planning of complex patients.

There were a number of limitations in previous literature reporting provision of human resources and nutrition practice in the UK and Ireland SCICs. These include a lack of activity-based data to support the recommendations.⁶ The previous study primarily focused on staffing levels in SCICs but, it failed to take into account the complexity of care, the amount of indirect care, telephone contacts and clinical outcomes, which in this study account for 60.9% of the working day. This is the first study to report activity in dietetic staff working in the UK and Ireland's SCICs.

Previous recommendations from SCIC dietitians suggested dietetic staffing level of 1.0 WTE dietitian to cover 60 SCI beds⁶, although this figure may limit dietitians to attend multi-disciplinary team meetings and undertake research. Of note, the BDA does recommend that an

extra 20% of staff time should be added when calculating for adequate levels of staff. The present study found that up to 12.4% of time was needed to cover absence (continue professional development, training and study leave—Table 4). After taking into account the required absence, the recommended staffing level would be 50 beds per 1 WTE dietitian, making the current provision seem even more inadequate.

Another important variance in staffing levels identified by the current study was the seniority of the dietitians. Only five of eight SCIC dietitians were funded at the recommended level of seniority, with one centre recruiting a newly qualified dietitian. As SCICs are specialist areas, it is inappropriate to expect a novice practitioner to have sole responsibility for the complex caseloads within SCIC, and may have effects that potentially compromise care.

Finally, in the present study, while six of eight SCICs reported using a validated nutritional screening tool, the nutrition-screening practices in SCIC are still below the recommendations set by National²⁰ and International²¹ best practice guideline that all patients should be nutritionally screened on admission to hospital by a validated nutrition screening tool.

Limitations

Thirty-two days 'work-sampling' sheets were returned, with 10 of these originating from dietitians working in teaching hospitals. There are recognised limitations when using work sampling tools and time and motion studies, including the 'Hawthorne effect'²² and over-estimation of time spent completing an activity²³, these problems are more apparent in continuous observation rather than self-reporting and therefore biases are likely to be limited in this study.

The healthcare environment also presents issues around patient confidentiality or infection control that can limit the undertaking of time and motion studies, therefore only a small number of published studies are available and low data return rates for this important aspect of care.

In addition, problems in collecting workforce data include 'definitional inconsistency', in that there is no consistent approach for capturing activity data that can subsequently be compared with previous studies. There are problems in describing what constitutes direct or indirect patient care and problems in making comparison between centres and professional groups.⁴ A consensus approach was utilized to mitigate these factors within this study.

CONCLUSION

This study has updated the workforce data and reported on dietitian's time and activity spent in SCICs in the UK and Ireland. The data sample can be considered to be indicative of activities undertaken by dietitians and may assist managers in their future workforce planning.

The study highlights staffing levels varied across the SCICs audited and some are below the professional recommendation⁶. Further research is warranted to assess whether optimised dietetic resources could prevent nutrition-related complications and a strategy to plan how to deliver services to achieve optimised clinical outcomes for patients with increasing limited resources; consistency in measurement of activity (and outcomes) would facilitate comparisons between studies and over time²⁴.

DATA ARCHIVING

There were no data to deposit.

CONFLICT OF INTEREST

Parts of the study data were presented at the International Spinal Cord Society Meeting in May 2015, in Montréal, Québec, Canada.

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- O'Riordan J Workforce Planning in the Irish Public Service. Research Paper no. 7. Institute of Public Administration: Dublin, Ireland http://www.ipa.ie/pdf/WorkforcePlanning_2011.pdf (accessed 08 February 2015), 2011.
- NHS England NHS Allocations for 2013/14 <http://www.england.nhs.uk/allocations-2013-14/> (accessed 15 December 2014), 2013.
- Meyer MK, Oslen MS. Productivity of the clinical dietitian; measurement by regression model. *J Am Diet Assoc* 1989; **89**: 490–493.
- Schoo AM, Boyce RA, Ridoutt L, Santos T. Workload capacity measures for estimating allied health staffing requirements. *Aust Health Rev* 2008; **32**: 548–558.
- Cartmill L, Comans TA, Clark MJ, Ash S, Sheppard L. Using staff ratios for workforce planning: evidence on nine allied health professions. *Hum Resour Health* 2012; **10**: 2.
- Wong S, Derry F, Grimble G, Forbes A. How do spinal cord injury centres manage malnutrition? A cross-sectional survey of 12 SCIC in the UK and Ireland. *Spinal Cord* 2011; **50**: 132–135.
- Ward F, O'Riordan J. A review of staffing levels and activity in paediatric dietetics. *J Hum Nutr Diet* 2014; **28**: 95–106.
- Scottish Executive Allied Health Professions: Workload Measurement and Management http://www.sehd.scot.nhs.uk/ahp/_documents/AHP (accessed 20 July 2014), 2006.
- Windle EM. Adequacy of dietetic service provision to adult critical care: a survey of 33 centres in Northern England. *J Hum Nutr Diet* 2007; **20**: 111–120.
- Windle EM. Nutrition support in major burn injury: case analysis of dietetic activity, resources and cost implications. *J Hum Nutr Diet* 2008; **21**: 165–173.
- New PW, Scivoletto G, Smith E, Townson A, Gupta A, Reeves RK *et al*. International survey of perceived barriers to admission and discharge from spinal cord injury rehabilitation units. *Spinal Cord* 2013; **51**: 893–897.
- Joint Standard Development Groups of the South England Review Group Standard for patients requiring spinal cord injury care (Revised 2010) <http://www.secsdg.nhs.uk/EasySiteWeb/getresource.axd?AssetID=99975&type=full&servicetype=Attachment> (accessed 20 November 2010) 2010.
- NHS England NHS standard contract for spinal cord injuries (all ages). NHS England, Redditch <http://www.england.nhs.uk/wp-content/uploads/2013/06/d13-spinal-cord.pdf> (accessed 09 September 2013), 2013.
- Health Research Authority Defining Research, NRES guidance to help you decide if your project requires review by a Research Ethics Committee <http://www.hra.nhs.uk/documents/2013/09/defining-research.pdf> (accessed 15 December 2014), 2013.
- Elia M (ed) Screening for Malnutrition: A Multidisciplinary Responsibility. Development and use of the 'Malnutrition Universal Screening Tool' ('MUST') for Adults. British Association of Parenteral and Enteral Nutrition, Redditch, UK, 2003.
- Wong S, Derry F, Jamous A, Hirani SP, Grimble G, Forbes A. Validation of the Spinal Nutrition Screening Tool (SNST) in patients with spinal cord injuries (SCI) – result from a multicentre study. *Eur J Clin Nutr* 2012; **66**: 382–387.
- Wong S, Derry F, Jamous A, Hirani SP, Forbes A. Is undernutrition risk associated with an adverse clinical outcome in spinal cord-injured patients admitted to a spinal centre? *Eur J Clin Nutr* 2014; **68**: 125–130.
- Hendrich A, Chow MP, Skierczynski BA, Zhenqiang L. A 36-hospital time and motion study: How do medical-surgical nurses spend their time? *Perm J* 2008; **12**: 25–34.
- Weigl M, Muller A, Zupanc A, Angerer P. Participant observation of time allocation, direct patient contact and simultaneous activities in hospital physicians. *BMC Health Serv Res* 2009; **9**: 1–11.
- National Institute for Health and Clinical Excellence (NICE) Nutrition Support in Adults: Oral Nutrition Support, Enteral Tube Feedings and Parenteral Nutrition. NICE, London 2006.
- Council of Europe Committee of Ministers Resolution RESAP on food and nutritional care in hospitals <https://wcd.coe.int/ViewDoc.jsp?id=857472003>.
- Roethlisberger FJ, Dickson WJ. *Management of the Worker*. Harvard University Press: Cambridge, MA, USA, 1939.
- Finckler S, Kinckman JR, Hendrickson G, Lipkin M Jr, Thompson WG. A comparison of work sampling and time and motion techniques for studies in health service research. *Health Serv Res* 1993; **28**: 577–597.
- The British Dietetic Association. *Caseload Management*. Birmingham: The British Dietetic Association: Birmingham, UK, 2012.

Supplementary Information accompanies this paper on the Spinal Cord website (<http://www.nature.com/sc>)