

Substitution across professions within the home care sector: an investigation of nursing and allied health services

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Abstract

Objective: The service type offered by a home care agency contracted by the Queensland government is not based on the qualifications of the worker providing the service, but the service itself. This allows agencies to substitute certain levels and categories of labour in order to provide a service to meet their contract obligations. This study investigated evidence of labour substitution between nursing and allied health services.

Methods: Correlation and regression analysis was performed on the data collected from 218 clients of a branch of a community-based service agency operating nationally in Brisbane, Australia, during April, May and June 2005.

Results: The results of the regression analysis revealed that when either allied health or nursing time rose by 10%, all else held constant, it was predicted that the other would fall by 4%. The subcategories, registered/enrolled nursing and physiotherapy, appeared to drive the inverse relationship between nursing and allied health service time. Registered/enrolled nursing service time was more sensitive to changes in physiotherapy rather than the other way around.

Conclusions: The higher labour turnover among allied health staff compared with the nursing staff reported by the agency implies a substitution of labour between the two professions to ensure that the needs of clients are met. Health policy makers and health care professional educators need to acknowledge that workforce shortages will inevitably reshape professional boundaries. Leaving labour-force substitution undiscussed and unplanned may compromise the quality and safety of care.

Aust Health Rev 2009; 33(1): 19–26

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What is known about the topic?

Health labour-force shortages are a worldwide phenomenon. One relatively controversial strategy to tackle shortages involves labour substitution.

What does this paper add?

Data collected from clients of a branch of a community-based non-government agency operating in Australia in 2005 were used to investigate the relationship between nursing and allied health service time received by clients. The study revealed evidence of informal labour substitution occurring within a community health service provider.

What are the implications for practitioners?

Since rising demand for health services is associated with an ageing population, labour shortages within the Australian health sector are expected to escalate. Health policy makers, health educators and health service managers need more knowledge and analysis of labour substitution as a strategy for meeting skill shortages. This article provides evidence of its occurrence.

HEALTH LABOUR-FORCE shortages are a world-wide phenomenon: the first Global Health Care Workforce Conference held recently in Geneva identified that 57 countries were currently suffering acute shortages of health care staff.¹ An increasing focus on exploring alternative ways of managing available staff as well as increasing total numbers and improving retention through better practice and workplace conditions has become a priority for many of these countries, including Australia.^{2–5} One relatively controversial strategy to tackle shortages involves labour substitution. Queensland took a tentative step in this direction when it introduced the role of the nurse practitioner specifically as a strategy to address general practitioner shortages in the rural sector.⁶ In 2005, Duckett published a list of tasks and associated professions which could be usefully substituted by less qualified and more available staff.³ Duckett's rationale for this proposal involved consideration of another health system

issue: that of the ageing population. He argued that this demographic change is increasing pressure to address the chronic, rather than the acute, burden of disease.³ Patients suffering chronic disease are generally managed at home with support from community health services, GPs and families.

It is very likely that care at home will form an increasingly important sector of the health care system for three main reasons. Care at home rather than hospital is regarded by both consumers, their families and health professionals as preferable and able to provide better health outcomes than care in institutions. This model of care is also more cost effective than long-term residential care as far as governments are concerned. The change in the demographic profile of people needing care towards older patients with chronic conditions also calls for a model of care which is community rather than hospital-based.

A review of community care services conducted in Australia by Henderson and Caplan published in 2008 concluded that current labour shortages of health professionals will have more impact on the home care sector than on any other because of its anticipated growth, and also because of its dependence on unpaid carers at home.⁷ The review found that there is a “multiplicity and rigidity” of service provision in the sector caused by most services being provided by independent non-government agencies under individually negotiated contracts with government departments. These services include various allied health professional, nursing, and home and patient care domestic services. Government plays a coordinating role via various assessment and care planning teams but service provision itself is necessarily fragmented due to the number of agencies involved. For example, an 86-year-old consumer with diabetes and a heart condition might need nursing care (eg, wound dressing, assistance with injections and skin care), podiatry, pharmacy advice and medication delivery, occupational and physiotherapy as well as shopping, cleaning, home maintenance and meals services, transport and library services. It is not difficult to imagine the complexities of not only this person's

care needs but also the communication challenges with various bureaucracies they or their families will face in order to optimise their care to prevent institutionalisation.

The current model of service provision for care at home within a health system facing labour shortages and rapid growth in demand needs attention. This article reports on a study conducted within one organisation within the home care sector which demonstrated that demand was being managed through increased, though informal, labour substitution.

The study was originally designed to examine the effectiveness of the ONI (Overall Needs Indicator) Tool as a predictor of resource requirements in one community-care-at-home service provider. The results, however, also revealed evidence of labour substitution occurring between nursing and allied health services. We report on this finding.

Methods

The data was collected from clients of a Queensland branch of a community-based non-government agency operating in Australia in 2005.

The agency is partially funded by the Australian government's Home and Community Care program (HACC). This program offers eligible clients and their carers a range of services at home. These services include allied health, nursing, respite care, transport, meals, housekeeping and other domestic assistance.⁸ Services provided through HACC play an increasingly critical role in the health maintenance of an ageing population: 20% of Australians aged 65 years and over received HACC services at home during 2002–2003 and this proportion is expected to rise.⁹ Eligible clients include frail aged people, people with dementia or mental illness, people with a disability, and their carers.

Data on clients receiving services were collected between April and July 2005. The research was approved by the Griffith University Human Research Ethics Committee and written consent for the release of the de-identified data obtained from the agency's Project Committee. Details on

the methods of the study have been presented previously.¹⁰

Agencies receiving HACC funding are required by Queensland Health to complete the ONI (On-going Needs Identification) survey for each client. The survey is a screening tool with multiple functions designed to prompt timely and appropriate service delivery, referral and or further assessment based on the issues and needs identified for each consumer. It measures both functional ability and functional burden by capturing the social, health and home-setting characteristics of each client who receives subsidised home care from the government. The ONI data captured in the survey were used in this study to analyse the relationship between nursing and allied health service time within the home environment.

The agency administered the ONI survey to all of their 226 clients serviced during the 3-month period. All the variables captured in the ONI survey were recorded with the consultation of the client, their carer and the agency's staff. If a client's condition restricted them from answering questions, their carer was consulted.

Client information obtained from the ONI survey was recorded on a spreadsheet. The project manager, an employee of the organisation, supervised the process, ensuring consistency of data collection and entry. Clinical terms were clarified and the data entry process checked. Data was later de-identified by the project manager and sent to the research team for analysis. Of the 226 surveys collected, the information of 218 clients was deemed sufficiently complete for analysis.

Model

Using SPSS software (Statistical Package for the Social Sciences; SPSS Inc, Chicago, Ill, USA), a bivariate correlation and linear regression were performed to analyse the data captured in the ONI survey. It was an assumption of this study that nursing and allied health wages were held constant.

Initially, a bivariate correlation computed the pairwise association for the variables nursing and allied health. This procedure determined the strength and direction of the association between

the two variables. Later, the two service categories were segregated further into subcategories of nursing and allied health tasks to ascertain the driving force of the general relationship between the two major categories, nursing and allied health. The subcategories of nursing included: registered/enrolled nursing; assessment nursing; palliative care; wound management; stomal therapy; diabetes management. The subcategories of allied health included: occupational therapy; dietetics and nutrition; social work; podiatry; diversional therapy; physiotherapy.

Regression analysis assists in the investigation of the relationship between nursing and allied health service time, controlling for client characteristics. Percentage changes provide a reliable indication of the relationship between the two variables. To measure the constant percentage change between nursing and allied health time the variables under investigation were transformed into their log.

The Models became:

$$\ln Nrs = \beta_0 + \beta_1 \ln AH_i + \beta_2 X_i + \epsilon_j \quad (1)$$

$$\ln AH = \beta_0 + \beta_1 \ln Nrs_i + \beta_2 X_i + \epsilon_j \quad (2)$$

Where $\ln Nrs$ and $\ln AH$ are the log of nursing and allied health minutes, respectively, received by the client. X_i is the vector of control variables that affect service time. These include gender (1 if male; 0 female), age (a continuous variable from 7 to 98 years), diagnosis category* (0 if other), receipt of personal care (0 if otherwise), existing client (0 if new client), and functional profile (activities of daily living score from 0 [worst] to 18 [best]).

Results

Data description

Since the client's condition impacts on the professional service type received, the descriptive statistics are segregated by diagnosis category. The total sample (refer last column of Box 1) comprised

* Dichotomous variable represented each diagnosis category. This allowed clients to have more than one condition.

I Descriptive statistics: clients of a community-based service provider by diagnosis category

Client characteristic	Diagnosis category (%)											Total
	Cancer/lymphoma/ leukaemia	Wound	Endocrine/nutritional metabolic	Nervous system disease	Eye/adnexa/ear/ mastoid	Circulatory system	Respiratory system	Musculoskeletal/ connective tissue	Renal/urinary	Other physical	Mental/intellectual/ behaviour	
Total number	24	52	54	22	25	57	47	84	33	24	36	218
Male	54.2	51.9	37	45.5	40	42.1	44.7	38.1	39.4	45.8	50	43.2
Female	45.8	48.1	63	54.5	60	57.9	55.3	61.9	60.6	54.2	50	56.8
Existing client	66.7	75	55.6	68.2	60	68.4	57.4	53.6	63.6	70.8	66.7	60.9
Capable of making own decisions	86.4	88.2	88.7	72.7	80	91.2	84.8	84.1	93.3	83.3	65.7	84.1
Lives alone	33.3	38.5	29.6	40.9	48	38.6	31.9	41.7	36.4	20.8	38.9	37
Receives nursing services	83.3	96.2	74.1	95.5	72	78.9	87.2	59.5	81.8	58.3	66.7	71.8
Receives personal care	12.5	32.7	33.3	54.5	40	38.6	46.8	33.3	36.4	37.5	47.2	30.5
Receives allied health	33.3	7.7	48.1	31.8	52	35.1	34	54.8	21.2	54.2	55.6	40.5
Mental health assessment required	20.8	1.9	13	4.5	4	8.8	29.8	16.7	21.2	20.8	11.1	11.4
Cooperates												
always	91.7	63.5	83.3	86.4	96	82.5	85.1	84.1	65.6	83.3	65.7	78.2
usually	4.2	25	16.7	9.1	0	14	14.9	12.2	21.9	16.7	25.7	14.5
rarely/never	4.2	11.5	0.0	4.5	4	3.5	0.0	3.7	12.5	0.0	8.6	6.4
Requires a carer	58.3	51.9	49.1	68.2	44	50	51.1	58	54.5	50	54.3	54.1
Carer available	70.8	50	75.5	72.7	48	58.9	72.3	70.7	72.7	70.8	63.9	64.1
Diagnosis category (% of total sample)	10.9	23.6	24.5	10	11.4	25.9	21.4	39.2	15	10.9	16.4	100.0

Source: Brisbane Survey, 2005.

43% males and 57% females. The ages varied between 7 to 98 years with most clients aged between 60 and 91 years. The mean age was 75 years. The majority of those receiving home services possessed functional profiles at the higher range, were able to make their own decisions (84%) and demonstrated adequate mental health (89%). Also, 61% were existing clients, 37% lived alone, 64% had a carer and 54% needed a carer. In addition, 96% of clients reported English as their main language and received a government pension. The main diagnosed conditions included: musculoskeletal sys-

tem/connective tissue disorders (38%; eg, arthritis); circulatory system (26%; eg, heart disease, stroke); endocrine/nutritional/metabolic (25%; eg, diabetes); and wound (24%).

Referring to the sample segregated by diagnosis category, a greater proportion of clients in the wound (96.2%), nervous system diseases (95.5%), and respiratory system (87.2%) categories received nursing services. Clients categorised with eye/adnexa/ear/mastoid (48%), musculoskeletal/connective tissue (41.7%), and nervous system disease (40.9%) dominated the allied health services. Clients may have more than one condition.

2 Correlations between allied health and nursing services by minutes

Allied health correlation coefficient (sigma 2-tailed)	Nursing correlation coefficient (sigma 2-tailed)						Total nursing
	Registered/enrolled	Assessment	Palliative	Wound management	Stomal therapy	Diabetes management	
Occupational therapy	-0.146* (0.031)	-0.058 (0.391)	0.038 (0.573)	-0.084 (0.217)	-0.021 (0.757)	-0.015 (0.827)	-0.130 (0.056)
Dietetics and nutrition	-0.132 (0.052)	-0.060 (0.380)	-0.061 (0.372)	-0.092 (0.174)	-0.023 (0.733)	0.278† (0.000)	-0.147* (0.030)
Social work	-0.108 (0.111)	-0.038 (0.578)	0.266† (0.000)	0.003 (0.961)	-0.019 (0.783)	-0.013 (0.846)	0.042 (0.535)
Podiatry	-0.163* (0.016)	-0.110 (0.106)	-0.012 (0.864)	-0.118 (0.082)	-0.030 (0.663)	0.222† (0.001)	-0.171* (0.012)
Diversional therapy	0.119 (0.079)	0.166* (0.014)	-0.030 (0.662)	-0.045 (0.507)	-0.011 (0.867)	-0.008 (0.906)	0.137* (0.043)
Physiotherapy	-0.377† (0.000)	-0.135* (0.046)	-0.129 (0.057)	-0.137* (0.044)	-0.049 (0.469)	-0.035 (0.610)	-0.443† (0.000)
Total allied health	-0.485† (0.000)	-0.139* (0.040)	-0.050 (0.464)	-0.235† (0.000)	-0.076 (0.261)	0.111 (0.101)	-0.487† (0.000)

* Correlation is significant at <0.05 level (2-tailed). † Correlation is significant at <0.01 level (2-tailed). Spearman's rho correlation measures the association between rank orders. Source: Brisbane Survey, 2005.

The K-10 score captured in the ONI survey, ranging from 10–50, measured the mental health and wellbeing of the client. Clients with a score of 16 or more were recommended for further mental health assessment. The K-10 score was converted into the dichotomous variable “mental health assessment required”, representing those that required further mental health assessment and those that did not. Referring to Box 1, a greater proportion of clients categorised under cancer/lymphomas/leukaemias (20.8%) or respiratory system (29.8%) required further mental health assessment compared with other categories. Typically, clients with these medical conditions experienced a longer duration of illness and were subjected to invasive treatments. The link between these conditions and secondary illnesses such as depression partly explained the higher K-10 scores recorded for these clients.

Correlation

Correlation coefficients range in value between -1 (a perfect negative relationship) and +1 (a perfect positive relationship). A value of 0 indicates no

relationship. No cause-and-effect conclusions can be drawn from the significant correlations reported below.

The results of the analysis, presented in Box 2, indicate a negative correlation of -0.487 (correlation is significant at the 0.01 level, 2 tailed) between allied health and nursing service time. For home care clients, nursing time increases (decreases) as allied health time decreases (increases).

The segregation of the analysis into subcategories of nursing and allied health services reveals substitution and complementary relationships between the services. The positive relationship between social work (a subcategory of allied health) and palliative care (a subcategory of nursing) confirms that they are complementary services, that is, one is usually consumed with the other. Dietetics/nutrition and podiatry (two allied health service subcategories) correlate positively with diabetes management (nursing subcategory).

The significant and inverse relationship between registered/enrolled nursing duties (a

3 Regression analysis results: the relationship between nursing and allied health service time*

Variable		Unstandardised coefficients	95% confidence interval for B	
Dependent	Independent	B	Lower bound	Upper bound
MODEL 1 InNrs	(Constant)	3.972	-10.242	18.185
	InAH	-0.426 [†]	-0.555	-0.297
	R ² (F value)		0.443 (9.358)	
MODEL 2 InAH	(Constant)	-3.773	-17.713	10.168
	InNrs	-0.410 [†]	-0.534	-0.285
	R ² (F value)		0.446 (9.488)	
MODEL 1a InENrs	(Constant)	8.734	-6.929	24.396
	InPhys	-0.347 [†]	-0.510	-0.185
	R ² (F value)		0.318 (5.492)	
MODEL 2a InPhys	(Constant)	2.516	-10.403	15.435
	InENrs	-0.235 [†]	-0.345	-0.125
	R ² (F value)		0.287 (4.74)	

* Control variables include gender, age, diagnosis category, personal care, existing/new client, functional profile. † Significant at < 0.01 level (2-tailed). Source: Brisbane Survey, 2005.

subcategory of nursing) and physiotherapy (a subcategory of allied health) implies a substitution of services (-0.377; correlation is significant at the 0.01 level, 2 tailed). These subcategory tasks appear to drive the inverse relationship between nursing and allied health service time.

Regression

The results demonstrate an inverse relationship between nursing and allied health service time. This relationship, however, may be driven by factors other than staff shortages. For example, clients who receive more nursing time may do so because they possess different types of diagnosis categories rather than because there is a substitution of services per se. To remove other influences from the analysis a standard multiple regression is performed to adequately identify the relationship between nursing and allied health service time.

A standard multiple regression is performed for the full Models (1) and (2) in order to investigate the relationship between nursing and allied health after controlling for client characteristics. With 218 respondents and 7 independent varia-

bles, the number of cases is above the minimum requirement of 112 (104 + 7) for testing individual predictors in a standard multiple regression.¹¹ The coefficient signs (either positive or negative) and their significance as reported in the regression models are as expected.

The results of the regression models (1) and (2) are reported in Box 3. The parameter estimates summarise the effect of each predictor. For example, in Model 1 the analysis determines the effect of allied health on nursing time after other influences such as client characteristics have been isolated. The slope coefficient B measures the percentage change in the dependent variable (eg, nursing time in Model 1) for a given percentage change in the independent variable (eg, allied health time in Model 1). Since the study's interest is confined to the relationship between nursing and allied health, the control variables (that is, gender, age, diagnosis category, personal care, existing/new client and functional profile) are included in the Models but not presented in Box 3.

The findings of the four Models are discussed below.

Nursing model — Model 1

Overall allied health and the control variables of the nursing Model (1) explain 44% of the variance in nursing time. The allied health time coefficient -0.426 gives the constant percentage decrease in nursing time as a result of a 1% increase in allied health services. If allied health time rises by 10%, all else held constant, it is predicted that nursing time will fall by 4%.

Allied health model — Model 2

Referring to the allied health Model (2), nursing and the control variables of the Model explain 45% of the variance. The nursing time coefficient -0.410 gives the constant decrease in allied health time as a result of a 1% increase in nursing services. If nursing time rises by 10%, allied health time will fall by 4%.

Registered/enrolled nurse model and physiotherapy model — Models 1a and 2a

Correlation analyses presented in the previous section show that registered/enrolled nursing (the subcategory of nursing) and physiotherapy (the subcategory of allied health) appear to drive the inverse relationship between nursing and allied health service time. Since certain client characteristics may distort conclusions from the findings, a regression analysis was performed to clarify the relationship between the two subcategories. The Models for the subcategories are:

$$\ln ENRs = \beta_0 + \beta_1 \ln Phys_i + \beta_2 X_i + \varepsilon_j \quad (1a)$$

$$\ln Phys = \beta_0 + \beta_1 \ln ENRs_i + \beta_2 X_i + \varepsilon_j \quad (2a)$$

Altogether, 32% of the variability in registered/enrolled nursing time is predicted by physiotherapy time and the control variables (refer to Model 1a). Registered/enrolled nursing time and the control variables predict 24 percent of the variability in physiotherapy service time (refer to Model 2a).

The regression analysis confirms an inverse relationship between registered/enrolled nursing and physiotherapy service time. Also, registered/enrolled nursing time is more sensitive to changes in physiotherapy rather than the other way around. That is, an increase in physiotherapy service time by 10% is predicted to decrease

registered/enrolled nursing time by 3.5% (significant at <0.01 level), whereas a 10% increase in registered/enrolled nursing time will decrease physiotherapy time by 2.4% (significant at <0.01 level).

Discussion and conclusion

This article reports on a study that found labour substitution occurring within one community health service provider. The implication of this study for government and service providers is a better understanding of workforce patterns within the home care sector. This may assist in workforce development as skilled labour shortages continue to worsen from the increasing burden of chronic disease in Australia's ageing population.

The significant and negative association between the subcategories registered/enrolled nursing duties and physiotherapy appeared to drive the general relationship between nursing and allied health service time. The results of the regression analysis that controlled for client characteristics confirmed substitution between allied health and nursing services and between the subcategories registered/enrolled nursing and physiotherapy. Nursing time was more sensitive to changes in physiotherapy than the other way round. In other words, nurses seem to be performing physiotherapy tasks but physiotherapists perform nursing tasks to a lesser extent.

Of course, the direction of this inverse relationship and substitution between tasks remains uncertain, and this is a limitation of the study. Yet, the higher labour turnover among allied health staff compared with nursing staff, as reported by the agency, suggests a substitution of labour to ensure that client needs are met. Alternatively, there may be a lagged effect between nursing and allied health. According to the administrators of the agency, nursing services are sometimes followed by allied health support. We believe that the latter explanation is less likely, given that the analysis adjusted for functional profile and diagnosis category. The study was conducted in only one organisation and so its limitations are sub-

stantial. Nevertheless, it provides some evidence that informal labour substitution is occurring. The issue warrants further investigation in view of global shortages of health care professionals.

The substitution of labour may be an effective and efficient strategy to alleviate the shortage of health professionals.⁸ Labour-force substitution, however, is a sensitive political and professional issue for health services. It may be one of those issues, like health care rationing, which is not discussed or planned for overtly, but which occurs nevertheless. It may be that health professionals working in the home care sector tacitly engage in blurring professional boundaries in order to meet the needs of their patients on a routine basis.

Policy makers need evidence of efficacy to support various strategies to address shortages. This study provides evidence of labour-force substitution occurring informally in one organisation. Further investigation using both qualitative and quantitative data collected from a larger sample of home care clients will lead to more conclusive results.

In the meantime, health policy makers and health care professional educators should acknowledge that workforce shortages will inevitably reshape professional boundaries. The problem with leaving labour-force substitution undiscussed and unplanned for is the potential for the quality and safety of care to be compromised. If the growing home care sector needs nurses who are expected to perform physiotherapy or any other allied health function normally outside of their role, then nurses should receive training and appropriate remuneration for this to occur rather than relying on informal arrangements. In the longer term, it may be necessary to reshape professional boundaries more radically through developing new, multidisciplinary roles which better reflect changing patterns of health care demand.¹²

Acknowledgements

We would like to thank the professional and administrative staff at the community centre studied for their time, knowl-

edge and approachability; and the Service Industry Research Centre at Griffith University for seeding funding.

Competing interests

The authors declare that they have no competing interests.

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(Received 4/12/07, revised 6/04/08, accepted 16/06/08)

