



Original Research

Nurse Practitioner's Geriatric Practice in Japanese Postacute Care Setting



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A B S T R A C T

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The quality of comprehensive geriatric assessment and medication reconciliation by a nurse practitioner (NP) based in Japan was evaluated by a prospective observational study. Within the 64 inpatients seen by the NP at a postacute care clinic, the achievement rate of 8 comprehensive geriatric assessment items was 93.8%, compared with just 33.8% in the nearby hospital ($P < .05$). The average volume and the number of types of medication on admission (9.2 and 4.7) and discharge (7.6 and 4.6) tended to decrease without statistical significance. NPs were suggested to have benefits toward geriatric care that may allow for much-needed task shifting in Japan.

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Introduction

Nurse practitioners (NPs) trained in geriatric medicine have the potential to provide high-quality medical care, especially for geriatric patients, but their effectiveness in Japan has not yet been examined. Japan is a well-known “super-aged society,” defined as a society where 21% or more of the total population is aged 65 years or older. The percentage of elderly people was 26.6% in 2015 and is estimated to be as high as 31.2% by 2030.¹ Elderly patients, defined as those aged 65 years or older, often have multiple comorbidities and may have additional issues to address, such as geriatric syndrome and social problems.

Geriatric syndrome is a term used to capture clinical conditions (eg, delirium, falls, incontinence, and frailty) in elderly people that do not fit into discrete disease categories.² Social problems may include external factors such as social isolation, poverty, and poor family support, which may negatively affect the life of elderly people. Different from young patients, who typically have a single or few problems, elderly patients tend to have multiple problems and the accumulation of these factors, which can interact each other, result in further deconditioning known as geriatric failure to thrive.

Demand for medical care in Japan is expected to peak between 2025 and 2040.³ Despite this well-documented, current, and still developing problem, there is concern whether the Japanese health care system is sufficiently equipped for this demand. Specific issues connected with geriatric care must therefore be addressed, including geriatric syndrome, comorbidities, and poor physical function, even after acute care has ended, until patients are discharged or transferred elsewhere.

In this context, most physicians in Japan are not specialized in geriatric care, which potentially affects the efficacy of the system. Only 30% of medical schools in Japan have departments specializing in geriatric care and relevant medical education.⁴ According to the Japan Geriatric Society, the number of geriatricians only accounts for 0.4% of all physicians in Japan.⁵ Moreover, such geriatric care could become an unmanageable workload and could prevent specialists from focusing on their area of expertise, potentially creating physician burnout.⁴

To overcome these issues, a recent movement has aimed at reform of the Japanese medical care system. One proposed solution is “task shifting,” the rational redistribution of tasks across members of the health workforce team.⁶ For example, several medical management tasks, such as blood glucose control, wound care, and ventilation management, could be taken up by nurses after completion of relevant training programs.

Meanwhile, geriatric care is broad, yet requires specific training, and there is currently no specific position in Japan that meets this demand. Unlike other countries,⁷ Japan does not have government-certified NPs or physician assistants, and it is thought that they could potentially play an important role in geriatric care. NPs could theoretically take up some of the work that is currently done by physicians, resulting in task shifting.

In Japan, NPs are nurses who have undergone specific training in a master's program, have a master's degree, and are certified by the Japanese Organization of Nurse Practitioner Faculties.⁸ Nurses are eligible to participate in NP training after 5 years of experience as a registered nurse. Japanese NPs are not, however, authorized on a national level by the Ministry of Health, Labor and Welfare. Currently, the extent of medical care provided by NPs is determined

by each institution, but their supervision by a physician is mandatory. For instance, in our institution, NPs are permitted to perform history taking, physical examinations, and order blood tests, imaging tests, and prescription of medication, if physicians are agreeable with the plan. The role of NPs can thus differ greatly between each institution. In some institutions, NPs additionally do the tasks associated with registered nurse's work, while in other institutions, such as ours, they predominantly do medical care on behalf of physicians and do less registered nurse work.

In other countries, meanwhile, the role of NPs is well established. In the United States, for example, states that use NPs as primary care providers are reported to have lower mortality rates and medical expenses.⁹ The quality of practice by NPs has also been indicated, based on reduced rate of readmission.¹⁰ NPs specialized in geriatric care have been indicated to be able to provide safe medical intervention in addition to their nursing duties.¹¹

We hypothesized that the use of NPs in Japan may be especially beneficial with regard to providing high-quality practice and care in postacute geriatric settings. This observational study assessed the quality of medical and geriatric care by a NP using comprehensive geriatric assessment (CGA) and medication reconciliation.

Methods

This prospective cohort observational study was conducted in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement.

Sample and Setting

Shinai Clinic ("the clinic") is a community-based institution in Osaka, Japan, with 19 beds for inpatient care. Unlike in other countries, where clinic care is for outpatients only, some clinics in Japan allow inpatient admission with a 19-patient capacity. All patients were transferred from nearby Takatsuki General Hospital ("the hospital") after management of acute illness. Eligible patients were those who were transferred from the hospital to the clinic within the study period, between September 1, 2019, and March 31, 2020. We excluded patients who refused participation in the trial, those waiting for scheduled hospital admission for surgery, and those under palliative care.

One NP was responsible for all inpatients, supervised by the on-duty attending physician, who countersigned the NP's documents. The NP's practice was mainly focused on care of the recent acute illness and other medical comorbidities, medication reconciliation, and CGA. The medical care by the NP consisted of history taking, physical examination, daily medical record description, patient education, assessment, and orders (blood test, imaging, and medication prescription) after agreement with physicians. The NP contributed to medical care only and was not assigned to usual registered nurse work. All practice performed by the NP was reviewed by the supervising physician, and plans were added to or modified as needed. Inpatient care was performed by the NP and the attending physician on weekdays, although it was covered on weekends and holidays by physicians in the conventional manner.

Data Collection

Collected patient characteristics were age, sex, acute medical conditions requiring hospitalization, details of the medical personnel in charge at the hospital (general internal medicine [GIM] physician, GIM NP, non-GIM physician), and the Charlson comorbidity index. The quality of medical care was evaluated by discharge rate to the scheduled destination (eg, to home or to a nursing facility), mortality rate, transfer rate to an acute care

hospital due to worsening condition, and readmission rate within 30 days after discharge. Transfer and readmission cases were assessed by 2 medical personnel, including the physician who had been responsible for the patient at the hospital. They considered 3 questions focused on the appropriateness of NP practice:

1. Did the NP miss any changes in the patient's condition that could have affected the cause of the readmission/transfer?
2. If there had been any changes, was the intervention provided in a timely manner?
3. Was the intervention medically valid?

The quality of geriatric care was assessed by CGA comprising 8 items: physical function, vision, hearing, nutrition, cognitive function, depression, medication, and nursing environment. A formal assessment of each item was also conducted if there was a decline in function (Table 1). The total number of performed CGA items was reviewed at the hospital and the clinic through medical records. If any of the CGA items were performed at the hospital, the number of CGA items performed during the stay at the clinic was analyzed to highlight the difference between the total number of performed CGA items in the hospital and in the clinic. We also reviewed the total volume of medication and the number of medication types on clinic admission and discharge.

The weekday working hours spent on inpatient care by the NP and the attending physicians were measured using a time card and stopwatch. Patient satisfaction with NP practice at the clinic was assessed by Likert scale. The patient and/or a family member was asked to answer an anonymous questionnaire using a tablet computer.

Ethical Considerations

This study was approved by the Takatsuki General Hospital and Shinai Clinic Ethics Boards in accordance with the Declaration of Helsinki.

Statistical Analysis

The total number of CGA items at the hospital and the clinic were analyzed using paired *t* tests. The average number of achieved CGA items on admission to the clinic before this study was 2.4 (30% of all 8 items). Based on the previous performance of a NP in our institution, we estimated that the number of achieved CGA items before discharge would be 4.0 (50% of all 8 items). The required power was set at $1 - \beta = 0.80$, and level of significance was kept at $\alpha = 0.05$. The calculated sample size was 54, and the study period was set as 7 months based on the average number of admissions to the clinic (20 patients per month) and the estimated proportion of patients eligible for our study among all patients (40%).

Subgroup analysis by the duty acute care hospital medical personnel (GIM physician, GIM NP, non-GIM physician) was also performed using variance analysis. The difference in the total volume of medication and the number of medication types between admission and discharge dates was analyzed using paired *t* tests, followed by variance analysis between the GIM physician, GIM NP, and non-GIM physician groups. All analysis was performed using Easy R (EZR) software (Saitama Medical Center, Jichi Medical University, Saitama, Japan). All statistical tests were 2-sided, and statistical significance was defined as $<.05$.

Results

We enrolled 110 patients, 64 of whom were eligible for the trial. All of those who were evaluated at the start of the study remained

Table 1
Comprehensive Geriatric Assessment Evaluation Table

Variable	Screening	Further Investigation
Physical function	ADL/IADL assessment	Barthel index, Timed Up & Go Test
Vision	Bedside vision acuity test	Ophthalmology referral if needed
Hearing	Bedside whisper test	Otorhinolaryngology referral if needed
Nutrition	Question of unintentional weight loss >5% within 6 months	Evaluation of nutrition problem
Cognitive function	Recall of 3 items after 1 minute (positive if ≥ 1 items cannot be recalled)	HDS-R (Japanese version of MMSE)
Depression	PHQ-2	PHQ-9, psychology referral if needed
Medication	Confirmation of medication use and person who is in charge of medication	Medication reconciliation
Nursing environment	Confirmation of family structure and care giver	Nursing environment modification if needed

ADL = activities of daily living; HDS-R = Revised Hasegawa's Dementia Scale; IADL = instrumental activities of daily living; MMSE = Mini-Mental State Examination; PHQ-2 = Patient Health Questionnaire-2; PHQ-9 = Patient Health Questionnaire-9.

in the cohort until the end of the study. We excluded 12 patients who refused participation in the trial, 3 patients who were waiting for scheduled hospital admission for surgery, 21 patients under palliative care, and 10 patients whose data could not be obtained by the end of this trial (Figure 1). Mean age was 81 years, and 70% were women. The average Charlson comorbidity index score was 5.2.

Sixty-one patients (95% of study population) were discharged or transferred to the planned destination. There were no deaths during the trial. The rates of transfer to the hospital and rehospitalization within 30 days after discharge were 4.6% and 10.9%, respectively. All cases of transfer and rehospitalization were assessed by 2 medical personnel who answered the 3 questions, and their answers were a complete match. They were unanimous in considering there were no problems as a result of the NP's practice.

The number of CGA items performed by the NP at the clinic significantly increased compared with care at the hospital ($P < .05$) (Table 2). The average number of achieved CGA items was 7.5 at the clinic compared with just 2.7 at the hospital. The analysis of variance showed the increase in CGA items performed by the NP in the clinic was most significant compared with the non-GIM physician group, followed by the GIM physician group and then the GIM NP group. The average total volume and the number of types of medication on the admission and discharge from the clinic were 9.2, 7.6, 4.7, and 4.6 respectively, all of which showed a trend of decrease without statistical significance.

Regarding the total volume and number of medications, analysis of variance revealed that in the clinic-based NP group, there was a decrease compared with the GIM physician and the GIM NP groups, but an increase compared with the non-GIM physician group (Figure 2). Detailed medical record review showed that in the GIM group (GIM physicians and hospital-based GIM NPs), analgesics, diuretics, and antacids were the main medications that were reduced or discontinued during the patient's clinic stay. In the non-GIM physician group, medication for hypertension, diabetes mellitus, constipation, and osteoporosis were commonly added to or increased during the patient's clinic stay.

Regarding time of inpatient care, the NP spent an average of 359 minutes daily on inpatient care, compared with an average of just 47 minutes by the attending physicians at the clinic. The physicians duties within an 8-hour period include both inpatient and outpatient care. Although there is variation in how their 8-hour shift is divided, we consider just 47 minutes to be especially short. Patient satisfaction questionnaires were answered by 50 patients for a 78% response rate (Table 3).

Discussion

To the best of our knowledge, this is the first Japan-based observational study to evaluate the quality of practice by an NP for elderly patients in a postacute setting. The community care system in Japan is integrated, and elderly patients are assisted in

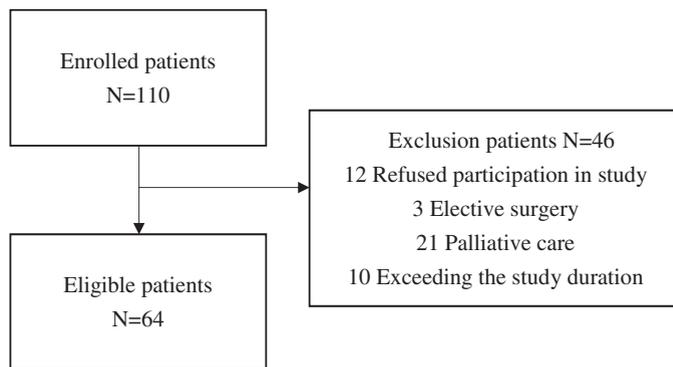


Figure 1. Flow diagram of eligible patients.

discharge back home or in transfer to a nursing facility after acute care. Recently, however, significant increases in the number of elderly patients mean that beds can easily become fully occupied, so patients who have recovered in an acute care hospital may be unable to be transferred. Due to age, low activity of daily living, absence of care givers, and overall frailty, many elderly patients admitted to an acute care hospital require comprehensive support for safe discharge.¹² Nationwide, the number of facilities and medical personnel may be inadequate for handling this issue.

As well as the shortage of institutions, physicians specialized in geriatric care are also in shortage due to imbalance in supply and demand. Wide reorganization of systematic geriatric care therefore appears to be necessary. Geriatric care requires comprehensive management by not only physicians but also by other medical professionals. The concept of task shifting should therefore be reevaluated as a measure against the shortage of geriatricians.

Medical care provided by NPs should be supervised by physician, so it is debatable whether each facet of medical care can be solely credited to the NP. In our institution, however, the NP proactively performed assessment and planning, just as medical residents do, and physicians mainly checked whether there were any unacceptable issues that may have resulted in malpractice. We can therefore at least suggest that the NP is playing a major role in

Table 2
Number of Comprehensive Geriatric Assessment Items Achieved on Admission and Before Discharge at the Clinic

Person in Charge	On Admission	Before Discharge	P Value
NP	7.8	8.0	.374
GIM physician	2.47	7.45	<.001
Non-GIM physician	0.25	7.75	<.001
Total	3.50	7.73	<.001

GIM = general internal medicine; NP = nurse practitioner.

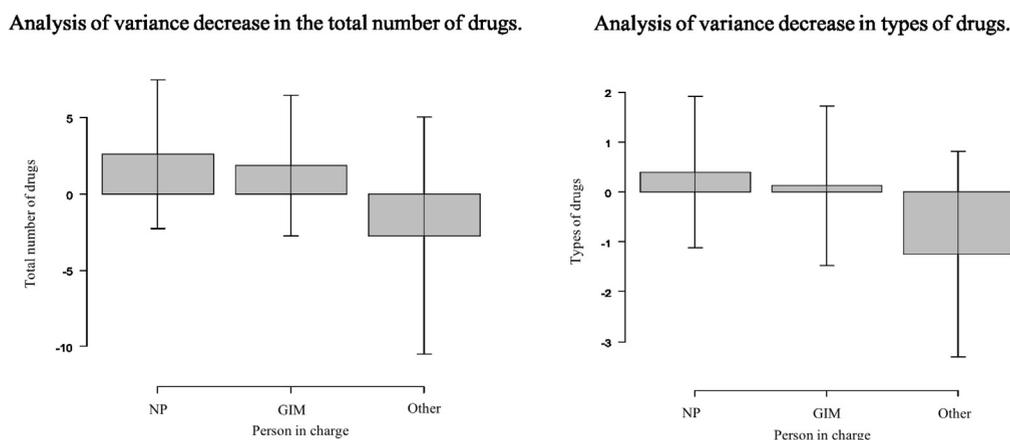


Figure 2. Analysis of variance decrease in (Left) the total number of drugs and (Right) decrease in the types of drugs. The top and bottom borders of the box mark the 75th and 25th percentiles and the whiskers mark the 90th and 10th percentiles. *GIM = general internal medicine physician; NP = nurse practitioner.*

contributing to the quality of care based on the type and quantity of their work.

A recent Japanese observational study reported a rehospitalization rate of 10.2% among 177 patients with the average age of 76.9 years in a conventional Japanese care system.¹³ Our data showed a readmission rate of 10.9% among 64 patients with an average age of 81 years, suggesting that medical care by NPs could be considered comparable to that in the current physician-centered medical care system.

In this study, safety of care was shown by all cases of transfer/rehospitalization being evaluated by 2 medical personnel, both in agreement that each transfer/rehospitalization could not have been prevented by substituting the NP with a physician. The causes of transfer/rehospitalization were considered to be unrelated to the practice by the NP.

In addition to general medical care, geriatric care was also assessed by performance of CGA items. CGA has been proven in

previous studies to be an effective tool for improvement of mortality in elderly patients.¹⁴ Although there are no globally accepted standards of CGA, we believe our study results suggest that the NP performed comparably effective CGA based on the other trials. Benefits of CGA were previously reported, and the achievement rate of CGA among the population was 42.6%.¹⁵

CGA performed by our NP at the clinic was more thorough than other medical personnel in the hospital, highlighting their ability to provide both nursing and medical care for elderly patients. This data agrees with that of a previous study that reported high affinity between NPs and treatment of geriatric patients.¹⁶

Frailty of elderly patients is a risk factor for major adverse outcomes, so assessment of frailty is a core component in their care. Systematic CGA of elderly patients may identify a variety of treatable health problems and could lead to better health outcomes.¹⁷

According to our data, the change in CGA performed items was most significant between the NP in the clinic and the non-GIM

Table 3
Patient Satisfaction Survey

Patient Satisfaction Questionnaire						
Was your primary care giver introduced as a nurse practitioner, not a physician?	No	Not sure	Yes			
No. (%)	1 (2)	6 (12)	43 (86)			
Did you receive an explanation of test and treatment by the nurse practitioner?	No	Yes, but not understandable	Neither	Yes, and somewhat understandable	Yes, and understandable	
No. (%)	0 (0)	0 (0)	1 (2)	32 (64)	17 (34)	
Did you have a discussion about your daily living with the nurse practitioner and receive any suggestion?	Not at all	Rarely	Neither	Somewhat	Enough	
No. (%)	0 (0)	2 (4)	6 (12)	18 (36)	24 (48)	
Grade your satisfaction of care provided by the nurse practitioner.	Unsatisfied	Barely satisfied	Neither	Somewhat satisfied	Satisfied	
No. (%)	0 (0)	0 (0)	3 (6)	20 (41)	26 (53)	
Compared with the care provided by physicians in the past, how was the care provided by the nurse practitioner?	Much worse than the care by physicians	Worse than the care by physicians	Neither	Equivalent of the care by physicians	Better than the care by physicians	
No. (%)	0 (0)	0 (0)	6 (12)	36 (72)	8 (16)	

physicians in the hospital. These data suggest that non-GIM physicians may not be familiar with geriatric care in an acute care hospital setting, and the shortage of geriatric care could be to some extent resolved by the use of NPs in the postacute setting. The efficacy of NP care in geriatric evaluation and management care units was shown in a previous study. The care provided by NPs resulted in less decline in physical function and lower rate of nursing home admission compared with usual care group.¹⁸

Regarding medication reconciliation, our data shows mixed results. There was a statistically nonsignificant overall decrease in the total volume of medication and the number of medication types among patients whose care was performed by the GIM group in the hospital. The GIM group in the hospital was already thought to perform polypharmacy management, and there was little impact of medication reconciliation by the NP in the clinic. This hypothesis is also supported by analgesics, diuretics, and antacids being the main medications being reduced or discontinued. Most of these medications were started at the hospital for the care of an acute illness, and the planned duration of their use was only short-term.

Meanwhile, although not statistically significant, there was an increase in the total volume of medications and number of medication types among patients whose care was performed by non-GIM physicians in the hospital. Most of the medications that were added by the NP at the clinic were for hypertension, diabetes mellitus, constipation, and osteoporosis. Based on the types of medication added, the result in this group could be explained by there being several comorbidities requiring medication that were not assessed during the stay in the hospital.

The mixed results suggest that NPs have the ability to modify medication based on the patient's condition and comorbidities, as suggested by a previous study.¹⁹ Assessment of polypharmacy aims to not only reduce the number of medications but also to add any type of medication if needed, based on the patient's situation. Our data showed the possibility that NPs in Japan could reduce polypharmacy similar to in other countries.^{20,21}

The medication reconciliation in our study was considered to be comparable to previous studies. One study reported that 57% of the patients discontinued 1 medication, while 11% discontinued 2 or more.²² If we only assess the NP group and GIM group, the number of decreased medications is similar.

We saw a significant difference in working hours between the NP and the attending physicians regarding care of inpatients. Under the current system in Japan, physicians working at the clinic are supposed to take care of at most 19 inpatients within their designated working hours, which are 8 hours daily. In our study, physicians could successfully limit their working hours for inpatient care within 1 hour by performing task shifting to NPs.

Lastly, the patient satisfactory survey toward NP was favorable. There was a concern that patients may have negative feelings about receiving care by nonphysicians. The results of this survey show that patients and their family members deemed the care performed by the NP to be a satisfactory alternative to physicians, possibly even superior.

Limitations

Our study has several limitations. It is an observational study, not a randomized controlled trial. Evidence of the quality of practice by NPs requires clarification in future studies. The current study was based in a single center, but the rate of patients aged older than 65 in this city is 28%, similar to the average national rate, suggesting that our community can be considered as a good representative of Japan overall.

Secondly, the CGA evaluation method was designed for statistical analysis, but this may not be completely reflective of the quality of care.

Finally, the NP at the clinic was involved in the design of this study, meaning the Hawthorne effect cannot be ruled out.

Conclusion

Medical and geriatric care by NPs was shown to be effective without compromise of the quality. Times for inpatient treatment by the NP and attending physician suggest the possibility of large-scale effective task shifting that would relieve the strain on the current Japanese system caused by the super-aged society.

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