Mechanism of Resource Allocation in long-term care

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(Abstract)

This paper quantitatively examines the relationship between the burden (case-mix of patients) and the resource allocation in 11 long term facilities in Japan. When the burden of a facility or a unit increased, the average staffing level increased statistically significantly but with weak correlation. In contrast, 63.0% of individually consumed resource in the Private level could be explained by the burden of patients. Although management factors and characteristics of units significantly influence to units' staffing level, the contribution of these two factors to the resource allocation in the Private level was small. Those findings suggest that facility managers decide the resource allocation not only by referring to some extent to the burden of units but also reflecting the management policy and the characteristics of units. Once staff members are assigned to a unit, they can recognize approximate burden of patients via their empirical sense, and decide to assign services mainly with regard to the burden of patients.

(Key word) Resource allocation, Long-term care, Staffing level, Burden of care, Characteristic of unit, Resource measurement, Case-mix,
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1. Introduction

The necessity for suitable assignments of fragile aged people to long term facilities and appropriate resource allocation in elderly care is rapidly increasing. But, even if a long-term facility in Japan takes care of more fragile elderly patients, the total amount of reimbursement is basically not increased, because the rates for care services are decided by capita regardless of the functional level of patients. This flat rate may have the potential to discourage facilities to receive more fragile patients1.

When many functionally fragile elderly persons enter a facility, the functional case-mix in the facility is shifted to the more deteriorated direction, the burden of care in the facility becomes greater, and the reinforcement of the staff is needed2-4. After an elderly person is assigned to a facility, he or she is reassigned to a unit and the resource assigned to a facility may also be divided and reallocated to some units. The principal hypothesis in this study is that the staff number is increased when the burden of care becomes heavier. And if staffing level is not influenced dominantly by the burden of care, the kind and the size of other factors are primary research questions.

Multi-factors may cause the wide range of staffing level differences among facilities or units. For example, the staffing level of the facility becomes higher, if a facility employs more staff for providing the higher quality of service. When a facility provides continuous and intensive unit patrols for preventing cognitively deteriorated patients from facing risky situations, a large amount of resource is required. The effects of (1) burden of care, (2) staffing policy of facilities, and (3) characteristics of units to staffing levels in units' level is main concern in this study.

The resource allocated to each unit is further divided and finally consumed for providing personal service. Some factors such as functional status of patients, or staffing level of units have the potential to influence the amount of care provided to patients. The resource allocation in patients' level is also examined in this paper.

2. Method
2.1. How to analyze the mechanism of resource allocation

As shown in Tab. 1-1, a functional case-mix of patients in a facility or a unit is defined with the four major types in the Typology of Aged Inpatients (TAI) in this study, including Border, Confused, Immobile and Medical types. The burden of care of a facility or a unit was also estimated by an average facility (or unit) Care Requirement Index (CRI) of TAI. The staffing level allocated to a facility or a unit is expressed with the 'average Total time' in this study, which is obtained with the summation of working minutes of every staff divided by the total number of patients. For example when ten staff members are working for 480 minutes (8 hours) per day in a unit where 40 patients are staying, the average Total time is 120 minutes (= 480 min. X 10 / 40 patients). The amount of the personal service is measured by the average Direct time. Direct time is the duration of time consumed for providing service face to face to a patient or patients, such as a spoon feeding, diaper changes, conversation, and medical observation of a specific patient. The Total time includes every service provided in units, equivalent to the summation of the Direct time and the Indirect time. Indirect time is the time consumed for indirect services such as a routine patrol of the unit, charting, rest and waiting and so on. When the staffing level is reinforced, the Direct time may not necessarily increase, although the average Total time always automatically expands because of the definition. The summary of TAI is displayed in Tab. 1-2 and the more detailed explanation is showed in the paper 'Introduction a Typology of Aged Inpatients'. According to the functional status of inpatients, they were classified into one of four major types, and into one type of 12 elderly types. Every elderly type is assigned the estimated weight indicating the burden of care, termed Care Requirement Index (CRI). The CRI is the ratio of 'the Direct time of each group' divided by '6.8 min. (the duration of Direct time consumed by the independent type (B-5))'. For example the CRI of C-2 type is 9.0, because C-2 type patients received Direct services for 61.5 minutes per day on the average and the B-5 elderly persons were provided services for 6.8 minutes (9.0= 61.5 min./ 6.8 min.). When one C-2 patient enters a facility, the burden of care of the facility is judged to increase 9.0 points of CRI in this study.

The vertical flows of both the patients' assignment and the resource allocation from the higher hierarchy to the lower hierarchy are quantitatively examined at the three levels in this study including the
facility level, the unit level, and the personal level. By measuring the Average CRI, the average Total time, and the Direct time in each levels, the relationship between the burden of care, the staffing level, and the amount of personal service are analyzed and the mechanism of resource allocation in long term-care is discussed.

2.2. Data collection

For measuring the average Total time and the personally allocated Direct time, the same resource consumption data collected for developing TAI was used. The detail related to the data collection and the reliability of the data is mentioned in the paper ‘Introduction of TAI’. The summary of data are shown below. By assigning a time-keeper to every staff member working in units, every service provided by 229 nurses and 367 care-givers in 11 long term facilities in Japan (4 Hospitals (14 units), 2 Intermediate Facilities (5 units) and 5 Nursing Homes (6 units)) was studied. A time-keeper observed a staff member, measured the duration of time with a stop-watch and recorded (1) Service contents, (2) Duration of time for providing a service, and (3) patient I.D. when service was provided directly to a patient. These time sampling studies were performed for 48 hours (2 days) in 8 facilities, and a 24 hour study was carried out in 2 facilities, and in one facility 3 out of 5 units were observed for 24 hours and 2 out of 5 units could be studied for 48 hours. A total of 341,832 service minutes was recorded. Because 20 out of 25 units were performed 2 day study, those units were dealt with as 2 unit samples and 45 (=2 X 20 + 5) unit samples were obtained. The patients, who continued to stay in the facility for 48 hours during the 2 day survey, were also dealt with as 2 samples. During the data collection, 1,260 patients (2 day sample :1,029, 1 day sample : 231) were staying in long term facilities and 2,289 samples could be collected. By summing up all duration of services recorded by time-keepers divided by the number of patients, the average Total time could be obtained. The summation of all duration of services recorded with patients’ I.D. divided by the number of patients was the average Direct time.

Within one week after finishing the time sampling study, staff members working in the unit completed questionnaires including questions related to the TAI. By summing up personal major type and CRI points of TAI, the Case-mix was examined and the average CRI (burden of care) were
calculated in both unit level and facility level. Before or during the time study, the author interviewed every manager in 11 facilities about the facility management policy, the self evaluation of service and so on. The author also had opportunities to talk with many staff members and some patients. These interviews and opinions were useful for data interpretation.

3. Result

3.1. Facility level analysis (Staffing policy and Facility Management)

An elderly person who requires institutional care in Japan is often assigned to one of three major categories of Japanese long-term facilities including gerontology hospitals, intermediate facilities. The characteristics of three major categories and staffing level described in laws are displayed in Tab. 2.

The relationship between the average CRI (burden of care) and the average Total time (staffing level) at Facility level in this study is shown in Fig. 1-1. Black rectangle dots (4) indicate the gerontology hospitals and black triangle dots (5) are nursing homes. Intermediate type facilities are expressed with black circles (2). By comparing with the theoretical minimum total time shown in Tab. 2, it is obvious that the staffing level of every facility in this study is above the minimum level and most facilities reinforce the staffing level. The regression line is 'Y = 56.3+14.6 X' and the r2 is 0.225 (r = 0.47). This figure suggests that the burden of care in hospital is heavier and the level of resource allotted to the hospitals is higher than those of the other two categories.

Fig. 1-2 displays the staffing policy and the staffing management of some institutes in this study. As the average Total time of 4 facilities (3 rectangles and 1 triangle) covered with the black oval exceed more than 50% of the minimum level, these facilities are named 'High Staffing Policy facilities'. When the author had interviewed all managers of each facilities and asked the staffing principle, the managers in these four facilities commonly emphasized the deliberate high staffing policy, although the characteristics of these four facilities were widely different.

As the staffing level was regulated not at unit level but at facility level in Japan, the trade off of staff members among units within a facility is allowed by the laws. Open dots bound with gray lines in Fig. 1-2 represents the resource allocation policies in two facilities. The left sided vertical gray line
indicates that the large scale of trade off of staff members between two units were performed according to the burden of units. The right sided horizontal line means that relatively even numbers of staff members were allotted to each unit. Fig. 1-2 suggest that both the High Staffing Policy and the Staff trade-off among units decided by the facility management should be treated as independent primary factors when the mechanism of resource allocation is analyzed.

3.2. Unit level analysis

3.2.1. Case-Mix in Unit level

The case mix of each unit in the first research day shown in Fig. 2 was judged with the major categories of TAI. When mobile Confused type patients were occupying more than 60% in a unit like H1-3, this unit was regarded as Confused type unit. If more than 60% patients were Immobile type like H1-2, this unit was classified into Immobile unit. Because only H1-1 was entirely occupied by Medical type patients, this unit was defined as the Hospital type unit. Although 59% of patients in I1-4 and 57% of patients in I2-3 were Border type patients, these units were assigned to the Border units. Other units, which did not meet the definition of Border, Confused, Immobile, and Hospital units, like H1-5, were classified into the Mix unit. This figure demonstrates that there is a wide range of case-mix variance among units in long-term facilities.

The last four lines show the summary of the case-mix in three types of long-term facilities and all samples in this study. 14% of patients in gerontology hospital were the Medical type, who required either an intensive medical care or an acute medical care or a tube feeding in contrast with only 3% and 2% of the Medical type patients in Intermediate facilities and Nursing homes. On the contrary, the ratio of Border type patients in hospitals was only 12%, although 28% and 25% of patients in Intermediate facilities and Nursing homes were classified into the Border type. The average CRI of Hospital was 7.6, the one of Intermediate facilities was 5.9, and the one of Nursing home was 6.0.

3.2.2. Burden of unit, Staffing level, and Personal service time in Unit Level
The open circles on the Fig. 3-1 indicate the relationship between an average unit CRI (burden of unit) and an average unit Total time (staffing level). The black squares show the relationship between an average unit CRI and an average unit Direct time (average time consumed for personal service). 48% of the explanatory variance of average unit Total time and 64% of explanatory variance of average unit Direct time could be obtained with using CRI. The plots corresponding to the hospital type unit are outliers and seem to have statistically a strong impact on the regression line and r². The regression line and the r² which we eliminate points representing the hospital type unit are displayed in Fig. 3-2.

By eliminating one hospital type unit, the slopes of the two regression lines are greatly decreased (Total : 17.3 -> 12.7, Direct 7.7 -> 5.7) and the r² of the average unit Total time declines from 48% to 24%, and the r² of the Direct time decreases from 64% to 40%. This hospital type unit was functioning as an ICU unit in a gerontology hospital and the case mix and the characteristic of the service was close to one of an acute hospital. As this study is focusing not on acute care but on long term care, it is inappropriate for the hospital type unit strongly to affect the regression line for estimation. Because of the obvious difference of the characteristic and the case mix, and because of the strong statistical impact, the samples eliminating the hospital type (44 units) shown in Fig. 3-2 were used later for the unit level analysis.

In a unit, 213 minutes of average unit Total time was consumed, and an average unit Direct time was 51.5 minutes ( % Direct = 24%). On the other hand, 50.5 minutes of Direct service were provided in a unit where only 124 minutes of the average unit Total time was consumed ( % Direct = 41%). Although the average CRI of both unit was 5.8 and the average Direct time provided was similar, there was 1.7 (=213 / 124) fold ratio in the level of Total time consumption (staffing level) between two units. The wide discrepancies of the Total time consumption among the similar CRI units cause the low explanatory variance ( r² = 0.24) of the correlation between CRI and the average unit Total time. As the Direct time is ' (Total time) X ( % Direct) ', the % Direct controlled by unit management is the important factor when the average unit Total time is estimated with the CRI.

3.2.3. Unit Characteristics
Fig. 4 was drawn by extracting the correlation and the regression line between the average unit CRI and the average unit Total time in Fig. 3-2 and the categorization classified by the characteristics of the unit defined in Fig. 2 were added. The location of points on Fig. 4 completely coincide with the open circle plots in Fig. 3-2. The four black and diamond shape plots at lower left side indicate the relationship between the average unit CRI (burden of unit) and the average unit Total time (staffing level) in Border units. The rectangle covering four points demonstrates the approximate area occupied by the Border units. The black bold line traversing the rectangle is the regression line determined by the four border unit points \( Y = -42.3 + 30.4X \) and the \( r^2 \) of the line is 0.52. Three polygons at the upper right side also demonstrate the extent of the space possessed by the Confused, Mix, and Immobile unit plots, and three lines crossing each polygon illustrate the regression lines composed by each group of plots. The Immobile units are expressed with black triangle plots. As the correlation between the average unit of CRI and the average unit Total time in the Immobile unit group is higher than ones of the other two groups \( (r^2 = 0.44) \). The relatively high correlation in the Immobile group may mainly derive from the characteristics of services required by the immobile type inpatients such as a spoon feeding, a diaper change, a regular bathing support, and so on. The variance of duration of service time needed for Immobile type patients among facilities is smaller than that needed for Border or Mobile Confused type inpatients. In Confused units drawn with white rectangle dots, the discrepancy of the average unit Total time between the highest level and the lowest level is intense, and the \( r^2 \) is only 0.07. There is also considerable variation among Mix units expressed with gray circle dots \( (r^2 = 0.12) \). The low \( R^2 \) in both Immobile and Mix group means that it is difficult to estimate the average unit Total time (staffing level) of these units using only the average unit CRI (burden of care). In other words, the contribution of CRI to determine the staffing level in Confused and Mix units is smaller than that in Immobile units. The characteristics of the unit is also an important factor when the mechanism of resource allocation is discussed.

The regression line of each characteristic is regarded as showing the expected staffing level, controlling for the characteristic and burden of the unit. The staffing level decided based on the regression line is named 'adjusted staffing level' in this paper. The unit which falls above the regression
line is defined as a high adjusted staff level unit. Two samples out of 20 low adjusted staffing level units belong to High Staffing Policy facilities because of the high CRI of the unit. This example suggests that adjusted staffing level is not equal to mere staffing level but instead it depends on burden of care and characteristics of units.

3.2.4. Factors affecting to Unit Resource Level

To analyze the influence of the burden of unit (CRI), staffing policy of a facility (HiStPo) shown in Fig. 1, and a character type of a unit (Border, Confused, Immobile, and Mix) to both the unit staffing level (average Total time) and the amount of personal service (average Direct time), the multiple regression analyses were performed with the four formula as shown below. The Type No. 1 analysis used only CRI. The factors the analysis No. 2 included were CRI and the Staffing Policy. The No. 3 analysis was focusing on CRI, the Characteristics of Unit. The No. 4 analysis was related to CRI, Staffing Policy, and Characteristics of Units.

(Type No. 1 analysis : CRI)

(A.U. Direct) or (A.U.Total) = A + CRI * XCRI

(Type No. 2 analysis : CRI and High Staffing Policy (HiStPo))

(A.U. Direct) or (A.U.Total) = A + CRI * XCRI + HiStPo * XHiStPo

( XHiStPo  is dummy variable : = 1 or 0 )

When a facility is included in the High Staffing Facilities, XHiStPo are = 1. If not, XHiStPo are = 0.

(Type No. 3 : CRI, Characteristics of Unit)

(A.U. Direct) or (A.U. Total)

= A + CRI * XCRI + Confused * XConfused + Immobile * XH-Immobile + Mix * XMix

( XBorder  is standard and  XConfused , XImmobile, XMix, are dummy variables : = 1 or 0 )

(Example : When a unit is a Confused type unit, XConfused = 1 and XImmobile =0, XMix = 0, and the formula is (A.U. Direct) or (A.U. Total) = A + CRI * XCRI + Confused.)
(Type No. 4 : CRI, High Staffing Policy (HiStPo), Characteristics of Unit)

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(A.U. \text{ Direct}) \text{ or } (A.U. \text{ Total}) = A + \text{CRI} \times \text{XCRI} + \text{HiStPo} \times \text{XHiStPo} + \text{Confused} \times \text{XConfused} + \text{Immobile} \times \text{XImmobile} + \text{Mix} \times \text{XMix}
\]

(\text{XHiStPo, XConfused, XImmobile, XMix, are dummy variables: } = 1 \text{ or } 0)

The results of these analyses are shown in Tab. 3. The result of the type No. 1 analysis is mathematically identical with the results shown in Fig. 3-2. By comparing with the Type No. 1 and the Type No. 4, the R2 of the average unit Total time (staff level of Unit) changes from 24% to 67%, although the R2 of the average unit Direct time (personal service time) increases only from 40% to 62%. This finding indicates that the personal service time is predominately influenced by the burden of care (CRI) and the staffing level is influenced more strongly by both the staffing policy of a facility and the characteristics of units. Because the P value of every CRI and every High Staffing Policy is less than 0.01, the effects of these two factors to the unit staffing level (average unit Total time) and the amount of personal service (average unit Direct time) are statistically significant. In other words, we can say that the staffing level in a unit and the quantity of personal service can be expected to increase when the burden of unit becomes heavier and when a facility takes a high staffing policy. Because the explanatory variance of average Direct and the average Total time in Immobile units were well explained with CRI (R2=0.44) as shown in Fig. 4, of the immobile group is not the statistically significance in Type No. 3 and Type No. 4 analysis (p values => 0.26). The statistical significance of the Confused and Mix unit were detected at the 5% level except for the average Direct time in the Confused type.

3.2.5. staffing level and Service Contents

When staffing level changes, what kind of service change occurs? Fig. 5 shows the difference of service contents in Confused units between the high staffing settings and the low staffing setting. The
difference of the amount of meal or toilet service is small. Because the mental service is mainly occupied by the observation by care-givers and the psycho-social service such as a conversation and some activities, and because the ratio of observation by nurses in the medical service is high in Confused unit, more than quarter parts of reinforced resource are consumed for observations and some psycho-social services. The increase of information task (mainly charting) is also remarkable.

3.3. Personal level analysis

3.3.1. Variation of Personally allocated Time in a Elderly Type

As the average facility CRI could explain 22.5% of the variance of the average facility Total time and 24.0% of the variance of the average unit Total time, CRI was not a sensitive predictor for estimating staffing level. Compared with the prediction of staffing level, CRI was more sensitive to the personal Direct time. CRI could explain 63.0% of the variance of Direct time in personal level.

Fig. 6 explains the distribution of personal Direct time consumed in some Japanese facilities by the C-3 type patients, who are mobile but mentally deteriorated, and require either toilet support or spoon feeding. The X axis is the personal Direct time, which means the duration of the minutes consumed for providing direct care service to each patient. The Y axis is the number of patients. The highest mountain shows that the range of Direct service time all C-3 type patients were provided is from 0 minutes to 140 min. The mode of all C-3 type patient was about 30 minutes and the average was 41.6 minutes. The low and right sided mountain drawn with the bold black line indicates the distribution of the Direct time consumed by the C-3 patients living in a high staffing facility. The mode of this group was about 40 minutes and the average was 50.8 minutes. On the contrary, the low left-sided mountain drawn with the bold gray line is the distribution of the Direct time consumed by the C-3 inpatients in a low staffing facility. The mode of the group was 10 minutes and the average was 28.5 minutes.

Although C-3 patients are regarded as the persons who are provided Direct service for 41.6 minutes per a day in the TAI (Typology of Aged Inpatients), the wide range of variation from 0 minute to 140 minutes should be noted. Although the explanatory variance of CRI was relatively high (R² = 63.0%), the variance shown in Fig. 6 has still remained. Most resource oriented instruments including
TAI show the average duration of time of each category. Fig. 6 demonstrates the actual implication of the average time displayed by resource oriented measures.

The average difference between a high staffing facility (50.8 min.) and a low staffing level (28.5 min.) is worthy of notice, although the highest average facility and the lowest average facility were selected for emphasizing the effect of staffing. This finding suggests that personally allocated Direct time is partially affected by a staffing level of a unit. The impact of the management factor and the characteristics of units to the amount of personal service was tested. When the facility management factor (whether a facility adopts High Staffing Policy or not) or the characteristics of unit was added as the independent variable to CRI, the explanatory variance of the personal Direct time increased only from 63.0% to 64.6% (contribution to R2 increase =1.6%) or from 63.0% to 64.1% (contribution to R2 increase =1.1%).

3.3.2. Effect of Resource Level to Personally Allocated Time

Tab. 4 and Fig. 7 shows the effect of the adjusted resource level to personally Allocated Direct time. The elderly persons classified into the Low group in Tab. 4 and Fig. 7 were the patients who stayed in the low staffing units defined in Fig. 5. As the comparison of the quantity of Direct service between high staffing units and low staffing units was performed after adjusting the case-mix and the characteristics of units, this result extracts the effect of Unit staffing level to the quantity of Direct service in personal level while eliminating the impact of the characteristics of units.

Except B-4 and M-I, the average Direct time in the High group is higher than that in the Low group. The Effect of ARL (Adjusted) in Tab. 3 indicates that the additional resource in high staffing units is not equally distributed but intensively allocated to the Cognitive type patients. On the other hand, the amount of service provided to the independent type (B-5) and the semi-independent type patient (B-4) is not remarkably increasing, when the staffing level of his or her unit is reinforced.

4. Discussion
The characteristic of a survey often causes the data bias. In this study, the facility whose staffing level is below the regulation level or whose manager felt guilty for the quality of service provided in his or her facilities did never want to join our intensive time sampling study. Consequently, what a facility attended this study caused the potential data bias. It is inappropriate to discuss the general overview of the staffing level or the case-mix in Japanese long term facilities with the results of this study. Considering this potential data bias, the resource allocation and the case-mix are discussed below.

It seems natural that facilities adopted the staffing level decided by the laws or by the reimbursement system in setting their actual level. But as shown in Fig. 1, all staffing levels in 11 facilities exceeded the level decided by regulations and reinforced some additional staff. This finding suggests that other factors apart from the standard level decided by laws strongly influence the actual staffing level of a facility.

The first definite factor is the burden of care which fluctuates according to the composition of the case-mix of facilities. When the average facility CRI (burden of facility) increased, the average Total time (staffing level) increased statistically significantly but with weak correlation as shown in Fig.1. According to the interview with managers in surveyed facilities, most of them were interested in the relative rank of the burden of their facilities compared with other facilities. But because resource measuring tools such as RUGs7-8 or TAI6 had not been disseminated in Japan, it was almost technically impossible for facilities to recognize their relative positions. If some relative evaluation methods9-10 which indicated the relative burden of facilities had already been popular in Japan when this study was performed, the CRI might be a more sensitive predictor.

The second primary factor, which effects the facility staffing level, is the management factor. Managers in the High Staffing Policy facilities commonly mentioned that the main reason to keep a high staffing level was their strong desire to provide high quality services, although individual managers differed widely in their motivation. The size of the staff assignment to units is also one of the primary contribution of facility management. As shown in Fig. 1-2, one facility indicates an outstanding weight variation in the staff assignment. Because the manager of the facility frequently worked in two units and provided care services in two units, and so he knew the relative burden of the two units via his personal
experience. Except when a manager is working in all units and can compare the burden of the units, it may be technically difficult for managers to carry out highly variable staff assignment levels without objective measures for evaluating the burden of units. But most of managers had the strong desire to perform reasonable staff assignment in according with the burden of the unit. If some reliable resource measures for evaluating the burden of units are disseminated, staff assignments with high contrast in weights but reasonable for the burden of the units will become more acceptable in Japanese long term facilities.

When the unit level staffing is discussed, the characteristics of unit should be addressed as the third factor. The variances of the amounts of services provided in Immobile type patient is small, because the items of service to the Immobile service are relatively fixed such as a spoon feeding, diaper change, hygiene services, transfers and so on, and the duration of time required for providing these services are stable. On the contrary, the contents and the duration of time required for providing services to Mobile Confused type patients has wider variance. Many Confused patients can eat and can go to a toilet independently and can live (or survive) with the lower level of resource consumption, if care-givers cut corners for providing services. But huge amount of resource is required if care staff members continue to observe patients' attitudes for preventing them from facing some risks, or try to provide sufficient amount of daily rehabilitation for maintaining their residual functions as shown in Fig. 5. The patients, whose amount of receiving service was changing with the widest range was also the Confused type when the staffing level of his or her unit was changing as shown in Fig. 7. The widely different staff assignment to Confused units were observed in this study. In some facilities, less staff level were allotted to Confused units compared with Immobile units. Some institutes assigned the same level of staff to Confused units. Other facilities intentionally allocated higher level of staffing number to Confused units. It is inappropriate to discuss the impact of the widely distinct staffing level in Confused units to the quality and the efficiency of services provided with using our data. But, we can point out the diversity of staffing level and the huge varieties of the services provided in Confused units.

CRI was a sensitive predictor for estimating the amount of personal service provided in the Personal level (R2 = 63.0%), although CRI was not sensitive for the estimation of staffing level in the
Facility level (R² = 22.5%) and in the Unit level (R² = 24.0%). As the result of multi-regression analysis shows in Tab. 3, the management policy and the characteristics of units significantly contribute to explain the variance of the Unit staffing level. On the other hand, these two factors were not influential in the Personal level, when the amount of personal service was estimated as shown in Result 3.3.1 (contribution of the management factor to R² increase = 1.6%, contribution of the characteristics of unit to R² increase =1.1%). These findings indicate that the unit staffing level decided by facility managers is influenced by multi-factors such as management factors, characteristics of units, and burden of care (CRI). The amount of Direct service in Personal level provided by staff members is mainly influenced by the CRI. It might be rewritten that facility managers decide the staffing level of units not only by weakly referring to the burden of units (average CRI) but also reflecting the management policy and the characteristics of units. Once staff members are assigned to a unit, they can recognize approximate burden of patient (CRI) not via objective measures but via their empirical sense, when they decide to assign their working hour to private service. Consequently, the contribution of CRI at Personal level becomes greater compared with at Unit level and at Facility level. High coincident rate of the CRI with the empirical burden of staff members was verified in a follow on sampling study.

The basic idea of this paper is that more resource should be allocated when burden of care becomes heavier. And the CRI is regarded as the indicator of burden of care in both facility level, unit level and personal level. According to the definition of the CRI, it corresponds to the expected duration of Direct time provided to each elderly types. Is the duration of Direct time provided to patients in proportion to their burden of care? Because the essential mission of long term care is to provide the direct service to patients to compensate for their deteriorated functions, we think the CRI can be basically regarded as the equivalent indicator to the burden of care with some exceptions. The first is related to the mental pressure of staff members working in Mobile Confused units11, which could not be counted as the burden of care with the method used in this study. The second exception is related to high ratio of Indirect care provided in Mobile Confused units, which are indispensable for mentally deteriorated patients such as frequent unit patrols and time consuming preparation for psycho-social activities, which
the CRI is not responsible for. These findings suggest that some additional adjustment is required to Mobile Confused unit when the required staffing level is estimated with the CRI.

As the expansion of aged generation is rapid, the burden of society for supporting fragile elderly will also rapidly become heavier. Two most important concepts for making social consensus for supporting the aged generation are the fairness and the optimization of available resources. The fairness can be rewritten as the transparency of the criteria which indicate what kind of elderly people can receive what kind of and what amount of services. By introducing objective resource measures to long term care, the criteria for resource allocation become more clear. The definition of the optimization is to allocate the supply according to the distribution of demand. For optimize the limited resource in long term care, the recognition of the distribution of the burden of the care is indispensable. Objective resource measures such as TAI and RUGs are the tools for scientifically quantify the demand of care. Although the perfect measure dose not exist, it is strongly suggested that the limited resource for elderly care is more optimally distributed to the deteriorated elderly, if reasonable objective resource measures are disseminated.

The authors would be greatly pleased that this study can contribute to the more efficient resource allocation in elderly care.

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6. References


3. Phillips CD, Hawes C. Nursing home case-mix classification and residents suffering from cognitive impairment: RUG-II and cognition in the Texas case-mix data base. Medical Care 1992; 30(2) :105


11. Fries BE, Mehr DR, Schneider D, et al. Mental dysfunction and resource use in nursing home. Medical Care 1933; 31: 898