The Impact of ‘Comprehensive Geriatric Assessment (CGA)’ Implementation on The Effectiveness and Cost (CEA) of Healthcare in an Acute Geriatric Ward

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ABSTRACT

**Aim:** to investigate the cost effectiveness of CGA in an acute geriatric ward.

**Methods:** a non-randomized controlled trial was carried out at Dr. Cipto Mangunkusumo General Hospital from January to December 2005. The inclusion criteria were elderly patients with geriatric syndrome. Exclusion criteria were advanced malignancy, APACHE II score > 34, in-hospital mortality in the first 24 hours, move to another ward before completing CGA management, the presence of dementia. After patients were allocated into CGA and non-CGA group, effectiveness was assessed using ADL/WHO-Unescap score, days of hospitalization, proportion of re-hospitalization, survival, quality of life score (EQ5D), patients and nurses satisfaction score. Cost effectiveness analysis was done using TreeAge-Pro 2004 software program.

**Results:** the length of hospitalization was shorter in the CGA group than in non-CGA group (10.99 [0.79] days vs. 20.16 [2.62] days; \( p = 0.00 \)). At the end of treatment, mean of ADL score changes was significantly higher in CGA group than non-CGA group. Mean of WHO-Unescap score changes in CGA group was higher than non-CGA group (0.71[0.04] vs 0.61 [0.04]; \( p = 0.09 \)). EQSD-VAS score was also higher in CGA group (0.79[0.01] vs 0.75[0.01]; \( p = 0.01 \)). Survival proportion in CGA group was lower than non-CGA group (80.37% vs 86.92%; \( p > 0.05 \)). Rehospitalization proportion was lower in non-CGA group than in CGA group (21.5% vs 11.21%; \( p = 0.04 \)). Patient's satisfaction level was higher in CGA group (193.38 [1.25] vs 177.47 [3.04]; \( p = 0.00 \)). Nurse satisfaction level was also higher in CGA group than non-CGA group but not statistically significant (225.06[7.08] vs 220.06[8.26]; \( p = 0.65 \)).

Mean of healthcare cost in non-CGA group was higher than in CGA group (Rp. 9,746,426.00 [1,180,331] vs Rp 4,760,965.00 [338,089]). Cost effectiveness analysis indicated that CGA was superior to conventional approach because for each point score of QALD's, total cost was lower in geriatric acute care unit than in conventional ward (Rp 418,199.00 vs Rp 628,695.00). Moreover, QALD’s in CGA group was better than in non-CGA group (24.1 vs 22.8; \( p = 0.03 \)).

**Conclusion:** the CGA approach is more cost effective compared to conventional approach. Quality adjusted life days are better in CGA group than in non-CGA group although survival is not statistically different. In CGA group, length of hospitalization was shorter, functional status and patient satisfaction is better in general. Working satisfaction of nurses in CGA group was not lower than in non CGA group.

**Key words:** approach, comprehensive, geriatric, cost-effectiveness, quality-adjusted life days.

INTRODUCTION

Demographic transition is currently taking place in Indonesia. The proportion of the elderly is increasing in number due to decreased total fertility rate and infant mortality rate. The total number of elderly population will increase significantly, by 414% in 35 years. In 2010, the elderly population whose age is more than 60 years in Indonesia is predicted at approximately 19 million.

Demographic transition will implicate in epidemiologic transition. The incidence of chronic degenerative disease and malignancy will be increasing. Common diseases in elderly will be more frequently found in common practice. Geriatric patients and their unique characteristics will be more frequently seeking help from doctors.

The characteristics of geriatric patient are, i.e., multi pathologic, non specific clinical symptoms, limited physiologic reserved capacity, functional status changes and frequently accompanied deranged nutritional status. Psychosocial status is often a burden for geriatric patients and their family. This complexity and challenging health problems of elderly urgently need special approach called comprehensive geriatric assessment (CGA).
Comprehensive geriatric assessment (CGA) evaluates not only physical, biological and medical properties of patients, but also psychocognitive status and psychosocial asset. The purpose of treatment is not only for curative measures but also to prevent disease or complication, maintain health status and patient’s condition. Interdisciplinary approach should be implemented instead of multidisciplinary approach.2,4,5

Comprehensive geriatric assessment (CGA) is hoped to give positive results in the management of geriatric patients in the hospital: 1). shorter length of hospitalization, 2). increased functional status at discharge, 3). increased survival, 4). decreased hospitalization, 5). increased quality of life, 6). increased patient’s satisfaction, 7). increased nursing staff’s satisfaction, and 8). no additional cost. The CGA is projected to be more cost effective compared to conventional approach. The first four items had been reported by several researchers abroad, but the other four have never been studied.2,6-10 Different health system management in Indonesia has given rise to a question: will CGA give better result?

To date, there has never been research or study in Indonesia that has proven that acute geriatric care with CGA is better than conventional internal medicine ward. The influence of CGA on length of stay, survival, functional status, health cost and rehospitalization still need to be verified. The influence of CGA on patient’s satisfaction, nursing staff’s satisfaction, quality of life, and cost effectiveness has never been studied. The aim of this study is to confirm the impact of CGA concerning these matters.

METHODS

Design of study was non-randomized controlled trial. Study population were hospitalized geriatric patients in an acute geriatric care unit (AGCU) and internal medicine ward in Rumah Sakit Cipto Mangunkusumo (RSCM). Sample of study in a proportion of study population that fulfilled inclusion criteria such as: age more than 60 years old and hospitalized due to geriatric syndrome as follows: delirium, instability and or falls, mild cognitive impairment, depression, urinary and or alvi incontinence, decubitus, and immobilization. Exclusion criteria were terminal condition/APACHE II (acute physiology and chronic health evaluation II) score >34, in-hospital mortality less than 24 hour, patient moved to another wards and not available to follow up, dementia, advanced malignancy, and patients or their family refusing to participate in the study.

Sample size was calculated using formula for comparison of two means unpaired sample and comparison of two proportions unpaired sample. Sample size needed was 107 patients for each group. The number of nurses to be evaluated in geriatric care unit was 13 persons while in the non-intervention were 12 persons (total number of nurses was 25 persons). All of them were included as study subjects.

Data collection was started by allocating patients according to CGA and non CGA group. Identity, date of admission, ADL (activity of daily living) score/WHO-Unescap (World Health Organisation-United Nations Economic and Social Commission for Asia and the Pacific) score, and APACHE II score were recorded. After acute phase was stabilized and patients were allowed to discharge from hospital, date of discharge, functional status, hospital expense, and EQ5D score were recorded. Quality of life score measured by EQ5D instrument was actually utility score of patients themselves. Utility score could represent total quality of life and how much time spent in the level of quality of life was incorporated in calculation. Thus, period of time to complete the calculation (usually year or day) had to be included. Total period of time (year or day) of a patient’s life span concerning quality of life aspect is called quality adjusted life years or days (QALY’s or QALD’s). In this study, number of days the patients were in certain level of quality of life until 30 days post hospitalization or until patients were re-hospitalized in 30 days post hospitalization were calculated. Patients were followed up for 30 days and evaluated when there was rehospitalization. When the patients died, time and cause of death were recorded.

Cost effectiveness analysis was calculated using the TreeAgePro-2004 program. Effectiveness evaluation is determined by these following factors: 1) improved ADL score, 2) re-hospitalization, 3) shorter length of hospitalization, and 4) better level of patient’s satisfaction. These evaluations were needed to determine the proportion of patients in effective and non-effective group in both CGA and non CGA group. This classification is needed for cost effectiveness analysis using TreeAge-Pro 2004 software program. QALD’s evaluation for each group should be done because it was required to calculate whether effectiveness unit had been produced. In matters of health cost, calculation included all total cost of patient during hospitalization and the cost for CGA implementation.

Data was processed using stata program version 9.0. Comparison of two means used t-test while comparison of two proportions used Pearson x^2 test.

This study used a questionnaires as an instrument for evaluation of nurse satisfaction, patient’s satisfaction, ADL Barthel and WHO-Unescap index. Trial-test of questionnaires was done to investigate its’ validity and reliability.
RESULTS

Subjects included in this study were 107 patients in CGA group and 107 patients in non-CGA group. Most of patients (79.91%) were between 60-75 years old (x = 69.88±0.52 years). Most frequent co-morbidity conditions were pneumonia (42.06%) and acute confusional state (38.79%). Most patients had moderate dependency level of functional status on admission (ADL score = 11.65 ± 0.43). Subjects’ characteristics in CGA and non-CGA group were shown in Table 1. There were no significant differences in ADL score, WHO-Unescap score, and APACHE score between CGA group and non-CGA group. There was no significant difference in mean of age between CGA and non CGA group.

Table 1. Subjects’ characteristics in CGA group and non-CGA group

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>CGA (n=107)</th>
<th>Non CGA (n=107)</th>
<th>p*</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADL score</td>
<td>11.79 (0.56)</td>
<td>11.50 (0.64)</td>
<td>0.74</td>
</tr>
<tr>
<td>WHO-Unescap score</td>
<td>11.09 (1.04)</td>
<td>10.88 (1.04)</td>
<td>0.70</td>
</tr>
<tr>
<td>APACHE score</td>
<td>8.25 (0.37)</td>
<td>8.37 (0.39)</td>
<td>0.82</td>
</tr>
<tr>
<td>Age (year)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- 60-69</td>
<td>48 (4.86)</td>
<td>63 (58.88)</td>
<td>0.10‡</td>
</tr>
<tr>
<td>- 70-79</td>
<td>44 (1.12)</td>
<td>35 (32.71)</td>
<td></td>
</tr>
<tr>
<td>≥ 80</td>
<td>15 (14.02)</td>
<td>9 (8.41)</td>
<td></td>
</tr>
</tbody>
</table>

*p value with independent t-test; † n (%); ‡ p value with chi-square test

Mean of length of hospitalization in CGA group was lower compared to non-CGA group (10.99[0.79] days vs 20.16[2.62] days; p=0.00). Functional status evaluated by ADL and WHO–Unescap score in early and at the end of hospitalization can be seen in Table 2. At the end of hospitalization, mean of ADL score in CGA group was increased significantly (p=0.00). Although mean of ADL score was also increased significantly in non CGA group, the increase of ADL score was higher in CGA group. Mean of WHO-Unescap score at the end of hospitalization was decreased in CGA group and non CGA group. However, the decrease of WHO-Unescap score in CGA was higher significantly than in non-CGA group (p<0.05).

Quality of life score in CGA group was higher compared to non-CGA group. EQ5D score (0.71[0.04] vs 0.61[0.04]; p=0.09) and EQSD-VAS score (0.79[0.01] vs 0.75[0.01]; p=0.01) in CGA group was higher compare to non-CGA group.

The proportion of patients who survived in CGA group was smaller than in non-CGA group (80.37% [86 patients] vs. 86.92% [93 patients]); however, it was not statistically significant (p>0.05). Further analysis was done in patients who died both in CGA and non CGA group. Table 3 shows no significant difference of age, APACHE score, initial ADL score between CGA and non-CGA group (p>0.05). When level of albumin, level of hemoglobin, and body mass index, were compared, it was found that level of albumin in CGA group was lower than in non CGA group (2.58 g/dl vs. 3.4 g/dl). Level of hemoglobin of patients in CGA group was significantly lower than non-CGA group (p<0.05). There was also significant difference of body mass index between CGA (18.24 kg/m²) and non-CGA group (19.50 kg/m²).

The proportion of patients in non-CGA group who must be re-hospitalized was bigger than in CGA group (21.50% vs. 11.21%; p=0.04).

Mean score of satisfaction aspect in technical capability of medical staffs, financial and time spent with doctors was significantly higher in CGA group than non-CGA group (p<0.05). Mean of interpersonal relation...
aspect, communication and access/availability/comfort in CGA group were higher in CGA group, but it was not significant statistically (p>0.05). In general, mean of total score of patient’s level of satisfaction in CGA group was significantly higher than in non CGA group (p=0.00).

Mean score of organizational behavior and leadership was higher in CGA group than in non-CGA group although not significant statistically. In general, total score of satisfaction level of nurse was higher in CGA group than in non-CGA group (p>0.05).

Table 4 shows mean of total expense of each patient during hospitalization. Mean of total cost during hospitalization in non-CGA group is higher than in CGA group (Rp 9,746,426.00 vs. Rp 4,760,965.00).

It must be taken into account that in acute geriatric care unit, medical rehabilitation is an integral part of geriatric team service. It means, medical rehabilitation consultation fee is included in standard geriatric care, thus, it will save more money.

Cost effective analysis was done using TreeAge-Pro 2004 which was calculated based on risk of ‘something’ taking place (improved effectiveness) compared to its complement. Effective criteria in this study were obtained from logistic regression which were as follows: 1) better ADL score at discharge; which included increased ADL.
score or maintained in level of independence; or 2) no re-hospitalization; 3) level of satisfaction score ≥ 184; 4) length of hospitalization ≤ 14 days. Effective criteria were used to determine the percentage of subjects considered effective and non-effective in CGA and non CGA group.

For cost effectiveness analysis, in CGA group, in addition to medical cost of the patients it was necessary to add the expense of hospital to implement CGA. Total cost for implementing CGA was Rp 4.020.153.00/patient with more details shown in Table 5. To obtain pay off point for each patient group (CGA vs. non-CGA group) both effective and non-effective, QALD’s (quality adjusted life days= number of days until patients must have re-hospitalization or maximum of 30 days if they were not re-hospitalized, times EQ5D score [level of health-related quality of life at discharge]) were calculated. Result of QALD’s calculation and the patient’s cost are shown in Table 6.

Data in Table 6 is then inserted in diagram (Figure 1) as follows: (cost per patient including medical rehabilitation consultation fee):

Based on data on figure 1, cost effectiveness analysis was done using TreeAgePro-2004 software program. Cost for non-CGA group was Rp. 10.260.301/16 QALD and for CGA group was Rp. 8.441.354/20 QALD. (Figure 2) The incremental cost and effectivity for non-CGA group was Rp. 1.8 million and -3.87 QALD respectively.
Actually, medical rehabilitation program was also recognized in the wards other than acute geriatric care unit (AGCU) but it was mainly recommended as not integral part of medical management. Nikolaus had proven that patients with CGA had better functional status than non CGA with medical rehabilitation recommendation.\(^2\) Landefield found that improved functional status was not influenced by disease and especially in those less than 80 years old.\(^2\) There are two important things to be emphasized: first, CGA should be implemented in all geriatric patient management regardless of their diagnosis at admission; second, benefit of CGA is mainly elderly in ‘less advanced age’. In ‘very old’ elderly, reserved capacity is already very limited and it is very difficult to improve functional status.

Geriatric patients who were allowed to discharge from hospital should have better health related-quality of life. EQ5D score of patients in CGA group was higher than in non-CGA group although was not statistically significant. If EQ5D-V AS was used, quality of life of patients in CGA group was significantly higher than in non-CGA group. Rich et al found that patients aged more than 70 years old and managed comprehensively by interdisciplinary team had better point in every component of quality of life.\(^13\)

This study found that Quality Adjusted Life Days in CGA group was significantly higher than in non-CGA group; this indicated the benefit of CGA based on health related quality of life measured by EQ5D. QALD utility unit was also possible to be calculated, in order to obtain preference in based quality of life measurement. In detail, CGA had the advantage of increased utility score (patient-oriented) -not only health provider-compared to conventional approach. In other words, this study had already proven that CGA was superior to conventional approach based on EBM (evidence-based medicine) and VBM (value-based medicine).

Proportion of survival in CGA group of this study was smaller than in non-CGA (80.37% vs. 86.92%; p=0.19). Reuben and Nikolaus did not find significant difference in survival between CGA group and non-CGA group in a period of 12 months after discharge from hospital.\(^2\) Of 21 patients with CGA and 14 patients with non-CGA who died (Table 3), the mean of age was higher in CGA group. Mean of albumin, hemoglobin, body mass index was worse in CGA group than in non-CGA group. These findings were similar in some studies.\(^15,18\) Although in the beginning of study APACHE score of patients who died both in CGA and in non CGA group were similar, survival difference was likely due to more severe metabolic condition in CGA group, not because of the intervention.

Figure 2 shows that the CGA approach is superior to non-CGA approach. For each point of effectiveness produced, total cost for every patient in CGA group is lower than in non-CGA group (Rp 418.199.00 [= Rp 8.441 million divided by 20 QALD] vs. Rp 628.695.00 [= Rp 10.260 million divided by 16 QALD]).
Re-hospitalization in CGA group of this study was significantly lower than in non-CGA. Naylor found that re-hospitalization in CGA group was 20.3% compared to 37.1% in non-CGA group (p<0.001).\textsuperscript{19} Nikolaus also found that although proportion of re-hospitalization was comparable in both CGA and non-CGA group, the length of re-hospitalization in CGA group was shorter than in non-CGA group (34.2 days vs 35.7 days).\textsuperscript{2} This study found that severity of condition in CGA and non-CGA group were similar (p=0.82). ADL score at discharge in patients with CGA was higher than in non-CGA (17 vs. 12; p=0.02). Improved functional status may have big role in describing the level of recovery in general.\textsuperscript{20} In other words, re-hospitalization was closely related to holistic approach implemented in CGA. Complete information in referral letter to family doctor and good discharge planning assure the continuity of recovery program and prevent worsening functional status.

Good healthcare service is hoped to give satisfaction. In general, in this study patients in CGA group were more satisfied compared to than non CGA group (p=0.00). Similar results were found in studies done by Cockram (1997) and Karppi (1995).\textsuperscript{21,22}

Based on the concept model of quality of healthcare by Zeithaml et al. discrepancy between hope and service is key factor to be solved in order to improve level of satisfaction.\textsuperscript{23} Giving the standard service such as CGA and understanding what the patient’s need will answer the discrepancy. If the health providers do not understand what the patient need, it is very possible the discrepancy still exists. Health providers always try to give their best services but sometimes fail to understand and recognize patient’s need. This is an important point because one of the goals in healthcare development is related to responsiveness of medical staffs to patient’s need.\textsuperscript{24}

Healthcare staffs (nurses) are internal customers and their level of satisfaction at work should also be evaluated. In this study, level of satisfaction in acute geriatric care unit was not significantly different from those in the conventional ward. Important thing to be pointed out was that CGA did not lower their level of satisfaction at work, although CGA implementation was not an easy job to do.

From cost effectiveness analysis, for each unit of effectiveness produced in CGA group, total cost which must be spent by the patient is lower (Rp 418,199.00 vs. Rp 628,695.00). In CGA group (medical rehabilitation is an integral part of geriatric care), total cost would be lower than those in non-CGA group (medical rehabilitation is not an integral part) [Rp 418,199.00 vs. Rp 431,505.00]. However, if geriatric team (with medical rehabilitation department) is still not available in a hospital, CGA implementation will save a considerable amount of money. This is in accordance with the third point of specific objectives of health care development according to WHO report 2000 concerning the financial condition of patients.

According to this study, CGA did not cause additional healthcare cost even though there was increase in effectiveness unit. Further, CGA based on value based medicine, is effective to increase patient’s quality of life and level of satisfaction without adding more burden to nursing staffs.

If the program would be implemented in hospital, acceptability and necessity factors must be considered. There are some important points to be emphasized:

- Make sure that proportion of elderly patients is large enough
- CGA can be implemented in various healthcare units such as outpatient clinic, acute care, day hospital care, chronic and home care service. As first step, CGA can be implemented in outpatient clinic and gradually in other care units.
- Persons in charge must have commitment to build geriatric team. Mechanism of geriatric team formation as initial step in implementing the CGA may consider these following steps: 1) forming or consolidation phase; 2) norming or agreement phase, and 3) performing or executing phase.
- After geriatric team is formed, there must be agreement to have continuous activities
- Activities will develop in accordance with demand.

This study had some limitations: questionnaires of level of satisfaction, quality of life of patients, and level of satisfaction of nurses had limitation in ‘measuring’ these matters more deeply. Since they are structured instruments. The use of oxygen was not calculated in total cost or expense because one source of oxygen was often used for more than one patient concomitantly. The possibility of selection bias could happen concerning the body mass index (BMI) which represented nutritional status. It was not measured as initial characteristic because most of patients were admitted to hospital due to pneumonia or acute confusional state. Thus, it was difficult to measure exact body weight. However, BMI as nutritional parameter was replaced by hemoglobin and albumin level in APACHE II score (metabolic aspects of nutritional status). Factors such as presence of medical staffs, social support, economic status, affection, cognitive condition, and health problem at admission were potential confounding factors. However, assessments of those factors were included in CGA.
approach and differentiate the CGA and non-CGA group. Severity of condition – including metabolic factor-controlled by exclusion criteria was based on APACHE II score.

CONCLUSION

CGA for the management of geriatric patients is more cost-effective. Geriatric patients managed with CGA has significant shorter length of hospitalization, better functional status at discharge, higher QALD’s, lower re-hospitalization, higher level of satisfaction, without lowering the nurse’s satisfaction level, nor increasing the cost spent. Better understanding of CGA with proven benefit without additional cost has made no reason to delay CGA implementation for optimal health service in the elderly.

REFERENCES