

# The comorbidity scoring systems for predicting survival in elderly dialysis patients and additional management strategies

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## Abstract

### Introduction

The worldwide elderly ( $\geq 65$  years old) dialysis population has grown significantly and is expected to have more comorbid conditions and shorter life expectancies than the general elderly population. Predicting outcomes for this population is important for decision-making. There are some studies about comorbidity scoring systems for predicting survival in dialysis patients. To establish a simple and practicable scoring system for predicting survival in the elderly population is increasingly important for physicians worldwide. The aim of this critical review was to discuss the comorbidity scoring systems for predicting survival in elderly dialysis patients and additional management strategies.

### Conclusion

Of the current comorbidity scoring systems for predicting survival in dialysis patients, the Charlson comorbidity index is considered the most predictive one than any other commonly used comorbidity scoring systems. Recently, a new

comorbidity index with good predictive value for patient outcomes was developed and validated in chronic dialysis patients. The new comorbidity index, even without the age component, is a strong predictor of mortality in elderly dialysis patients. Using one or both of these scoring systems, a physician may be able to provide some helpful objective opinions and suggestions to elderly patients who must choose between initiating and not initiating dialysis.

### Introduction

The worldwide dialysis population is growing rapidly, and its prognosis is much poorer than that of the general population<sup>1</sup>. Moreover, the probable cause of the complications of dialysis<sup>2</sup> is that dialysis patients have a high prevalence of comorbidities, such as atherosclerotic cardiovascular disease (ACVD), congestive heart failure (CHF), hypertension (HTN), diabetes mellitus (DM), and cognitive and functional impairment, all of which are risk factors for mortality<sup>1,3</sup>. In addition, the "age" factor is a strong predictor of mortality in many studies<sup>4,5</sup>. As the number of elderly has rapidly increased worldwide in recent decades, the elderly ( $\geq 65$  years old) dialysis population has also significantly grown<sup>1</sup>. Elderly patients have been the most rapidly rising group of incident dialysis patients in many developed and developing countries. Furthermore, the increase in those above 75 years old is greater than in those 65–74 years old<sup>1</sup>. Because people older than 75 generally have multiple comorbid illnesses, and a much poorer quality

of life and a shorter life expectancy than the general population, palliative care without dialysis intervention maybe considered the primary treatment<sup>6,7</sup>. For an objective evaluation of their prognosis, several comorbidity index scoring systems have been used<sup>8</sup>. This review discusses the comorbidity scoring system for predicting survival in elderly dialysis patients.

### Discussion

#### The different comorbidity scoring systems

There are many studies on the current comorbidity scoring systems for predicting survival in dialysis patients. These systems include the Charlson comorbidity index (CCI)<sup>9</sup>, the index of co-existent diseases (ICED)<sup>10</sup>, the Wright–Khan indexes<sup>11</sup>, and the Davies et al.<sup>12</sup> index. The CCI has been widely used in many longitudinal studies of patients with a variety of disease states<sup>9</sup>. Thus, some studies have introduced the CCI and examined its validity in end-stage renal disease (ESRD) patients<sup>13</sup>, in peritoneal dialysis patients<sup>14</sup>, and in maintenance haemodialysis (MHD) patients<sup>15</sup> with satisfying results. In addition to the studies of CCI, Khan et al.<sup>11</sup> designed a comorbidity index for survival analysis with a study population of 375 dialysis patients, and Davies et al.<sup>12</sup> used another comorbidity index to analyse 97 continuous ambulatory peritoneal dialysis patients. However, the CCI seemed to be significantly more predictive for mortality in dialysis patients than were these other two<sup>13,14</sup>. Recently, Liu et al.<sup>16</sup> modified the CCI and developed a new comorbidity index

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**FOR CITATION PURPOSES:** Kan WC, Wang JJ, Sun YM, Hung CY, Chu CC, Chien CC. The comorbidity scoring systems for predicting survival in elderly dialysis patients, and additional management strategies. OA Nephrology 2013 Jul 01;1(2):12.

(nCI) for dialysis patients. Interestingly, although the nCI includes 11 comorbid conditions but not the age factor, one of the components of the original CCI, its results still showed that nCI is a better predictor than the CCI (Table 1). Our previous study<sup>17</sup>, using information from the Taiwan National Health Insurance Research Database (NHIRD), found that the predictive value of the nCI in elderly dialysis patients was similar to that of the CCI.

### The dilemma of decision-making for elderly patients who need dialysis

When the elderly population, especially the very elderly ( $\geq 75$  years old), encounters the possibility of dialysis, the nephrologist often has to face a decision-making dilemma after considering many aspects about each patient's underlying condition and probable outcome<sup>18,19</sup>. Some studies found that mortality in elderly patients is both closely correlated with many comorbidities and independent of age<sup>20,21</sup>. Therefore, some scoring systems have been developed to help the physician assess whether a dialysis patient will live long enough to benefit from the therapy and have their life span prolonged<sup>13-15,22</sup>. However, most studies did not focus on elderly dialysis patients, some of whom may have several clinical assessments and laboratory datasets just to predict short-term (6–12 months) survival<sup>22,23</sup>. For all of these scoring systems, age was always a strong independent predictive factor. Liu et al.<sup>16</sup> modified the CCI without including the age factor and developed the nCI to analyse outcomes for dialysis patients. The nCI had good predictive value and was reliably reproducible in the large USRDS database dialysis population. One study<sup>17</sup> used the nCI to analyse the Taiwan NHIRD dialysis population to try to validate a relatively easy approach for predicting the outcomes of elderly patients after they had begun dialysis. In

Comorbid conditions	Weighted score
Diabetic mellitus	1
Congestive heart failure	3
Coronary artery disease	1
Cerebrovascular disease	2
Peripheral vascular disease	2
Other cardiac diseases	2
Dysrhythmia	2
Chronic obstructive pulmonary disease	2
Gastrointestinal bleeding	2
Liver disease	2
Cancer	2

summary, it is found that the patients in the highest score group had the highest mortality risk, and that after 5 years of dialysis, the survival rate of patients in the lowest score group was three times better than that of patients in the highest score group. Based on the data, the nCI score showed good predictive value in the elderly dialysis population.

### The comorbidity in elderly dialysis patients

The elderly population generally has many comorbid conditions, and the number of comorbid conditions may also reveal an inverse relationship with quality of life<sup>24,25</sup>. Those comorbid conditions may also cause easy falls, frailty, and functional impairment, which increase further morbidity and mortality in the elderly<sup>25</sup>. Therefore, we can expect that elderly dialysis patients with lower comorbidity scores will live with a better quality of life than the elderly in the general population. In contrast, patients with higher comorbidity scores had a shorter life expectancy. A recent study<sup>18</sup> also found that dialysis may not be beneficial for the survival of patients over 75 years old with multiple comorbidities and cardiac ischaemia. Although dialysis

definitely provides a life-sustaining therapy and extends patients' lives, it may also aggravate or prolong a patient's suffering for the remainder of his or her life, and even extend the dying process. Elderly dialysis patients will suffer from a substantial and sustained deterioration of functional status after beginning dialysis, especially if they live in a nursing home<sup>26</sup>. Because elderly patients generally have more comorbid conditions than younger patients, they may suffer more in daily life from the related complications. For example, peripheral vascular disease (PVD)-related amputation causes not only severe functional impairment, but also a huge health burden in many countries<sup>27</sup>. In this complicated population, we should consider renal palliative care for patients more than 75 years old, with more comorbidities (i.e., higher comorbidity scores), and especially those with poor activities of daily living status<sup>28</sup>.

### The prevalence of different comorbidities in elderly dialysis patients

From the NHIRD data, 51.5% of the elderly dialysis patients in Taiwan were in a low nCI score group ( $\leq 3$ ). One possible explanation is that elderly

patients with chronic kidney disease may have obviously high rates of multiple comorbid conditions<sup>29</sup> and, therefore, may die younger because of the related complications of their underlying chronic diseases (such as DM, CAD and CHF), and have a relatively shorter life span without facing the choice of dialysis. In addition, there may be a selection bias: elderly patients with ESRD and multiple comorbid conditions might be more likely to be treated with palliative therapy because of their short life expectancy and significant differences in survival between the four nCI score groups were still found. Because many of these elderly patients were in the lowest nCI score group with relatively few comorbid extra renal conditions at the beginning of dialysis, age alone was not the only or the most important consideration for decision-making. More aggressive dialysis therapy should be considered a preferred choice for patients in the low nCI score group, even for octogenarians<sup>20,21</sup>.

### The Recommendations from the Renal Physicians Association and the American Society of Nephrology guidelines

According to the Renal Physicians Association and the American Society of Nephrology (RPA/ASN) guidelines<sup>30</sup>, pre-ESRD patients and their families should receive clear information about their prognosis and all treatment options before shared decision-making about whether or not to begin dialysis. However, these guidelines do not provide specific reliable means for estimating an overall prognosis in octogenarians<sup>31</sup>. Several studies<sup>32</sup> also found that patients with poor outcomes still expected their physicians to explain their prognosis in detail. Therefore, a good comorbidity scoring system can provide quantitative estimates of life expectancy for different score groups; and the information about life expectancy may support the physician by providing satisfactory explanations

to elderly patients about to begin dialysis, and also encourage patients without many comorbid conditions. It may afford an objective suggestion for the physician who needs a patient's informed consent.

### The alternative treatment for elderly patients unwilling to accept dialysis and their fate

After considering possible dialysis a "burden", which may be for one or more physical, emotional, or economic reasons, some elderly patients may decide to refuse dialysis therapy. An alternative strategy used in Europe as maximum conservative management (MCM) can therefore be taken<sup>33,34</sup>. This strategy should be used in a multidisciplinary medical and par-medical staffs, including the nephrologist, certified nephrology nurse, dietician, social worker, etc. These patients may receive similar care as those patients with advanced (stage 5) chronic kidney disease (CKD), with more emphasis on the supportive and symptomatic treatments. One study analysed 202 patients older than 70 years with CKD stage 5 in the United Kingdom<sup>34</sup>. Among these patients that fit the study criteria, 29 patients chose MCM, while another 173 patients chose dialysis. Although the dialysis patients lived longer than MCM patients (median survival duration: 37.8 versus 13.9 months), but spent more time for hospitalization (173 versus 16 days per patient-year). Besides, those receiving MCM were significantly more likely to die at home or in a hospice (odds ratio 4.15). Therefore, dialysis therapy may prolong the patients' life, but not improve their quality of life. Such study results maybe helpful in counselling patients and families.

### Palliative treatments for patient given maximum conservative management

In patients given MCM, symptoms can develop as soon as the uraemia is aggravated by weakness, itchiness,

drowsiness, dyspnoea, pain, poor appetite, limb oedema, etc., before the last month of their life. The prevalence of both physical and psychological symptoms and the number reported were higher than those in patients with advanced cancer in the month before death<sup>35</sup>. Therefore, the World Health Organization guidelines for pain management can be referenced<sup>36</sup>. Hydromorphone and fentanyl are both superior to morphine and meperidine because of their fewer side effects for impaired renal function. It is clear that end-of-life symptom management and hospice care are an important focus for those unwilling to undergo dialysis therapy<sup>30</sup>.

### Conclusion

The CCI is considered the most predictive than other commonly used comorbidity scoring systems. Recently, an nCI with good predictive value for patient outcomes was developed and validated in chronic dialysis patients. The nCI, even without the age component, is a strong predictor of mortality in elderly dialysis patients. Old age alone should not be used as an absolute barrier to treatment when considering the benefits of dialysis in elderly ESRD patients. The elderly dialysis population (especially  $\geq 70$  years) with low nCI scores (i.e., few comorbidities) may have acceptable mean life expectancy. Aggressive dialysis rather than conservative care should be considered preferentially in this population, especially in patients without obvious functional impairments. Using one or both of these scoring systems, a physician may be able to provide some helpful objective opinions and suggestions to elderly patients who must choose between initiating and not initiating dialysis.

### Abbreviations list

CCI, Charlson comorbidity index; ICED, index of co-existent diseases (ICED); nCI, the new comorbidity index;

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NHIRD, the Taiwan National Health Insurance Research Database; RPA/ASN, the Renal Physicians Association and the American Society of Nephrology

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