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Acute renal injury incidence is growing in the elderly inpatients – a tertiary-level academic single centre observation over 5 consecutive years

Ostre uszkodzenie nerek jest coraz częstsze u osób starszych – pięcioletnia obserwacja jednego ośrodka akademickiego trzeciego poziomu referencyjności

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Summary

Introduction. Acute kidney injury (AKI) incidence in general population is difficult to evaluate, seems to increase in all age groups, but the published data are scarce. We hypothesized that the diagnosis of AKI would increase over time, especially in the elderly population.

Aim. Primary – verify if the frequency of AKI diagnosis among nephrology service inpatients older than 65 years of age has been growing over time. Secondary – evaluate if the trend was similar among younger inpatient medical population, and what was the relative total impact of AKI among elderly on the demand for AKI services.

Method. Retrospective study analysing single centre administrative data from hospital database.

Materials. Medical diagnoses and age from electronic medical records.

Results. Patients 65+ accounted for a stable fraction of 56-59% of hospitalized each year. In patients < 65 the incidence of AKI was stable within 8-11% (3-5% of all patients). In patients 65+, the AKI incidence increased from 17% to 25%, and accounted for 73-82% of all cases of AKI.

Conclusions. Incidence of AKI diagnosis is increasing in elderly, but not in patients below the age of 65. The AKI in patients of 65+ accounted for 80% of all AKI cases in nephrological service, and that fraction has been growing steadily.

Key words: acute kidney injury, acute renal failure, elderly

Streszczenie

Wprowadzenie. Częstość ostrego uszkodzenia nerek (AKI) w ogólnej populacji jest trudna do określenia, wydaje się wzrastać we wszystkich grupach wieku, ale opublikowane dane są bardzo skąpe. Założyliśmy, że częstość rozpoznania AKI powinna wzrastać w kolejnych latach, nawet w pojedynczym ośrodku nefrologicznym, zwłaszcza w populacji osób starszych.

Cel. Pierwotny – sprawdzić, czy roczna częstość rozpoznania AKI wzrasta u pacjentów Kliniki Nefrologii CMKP (KN CMKP) w wieku 65 lat i więcej. Wtórny – czy częstość rozpoznania AKI wzrasta także w młodszej populacji pacjentów, a także, jaki jest wpływ wzrostu AKI w populacji starszej na obciążenie ośrodka nefrologicznego świadczeniami na rzecz pacjentów z AKI.

Metoda. Badanie retrospektywne analizujące dane administracyjne pacjentów KN CMKP zgromadzone w szpitalnej bazie danych.

Materiały. Rozpoznania kliniczne oraz wiek z elektronicznych historii chorób pacjentów KN CMKP.

Wyniki. Odsetek pacjentów 65+ wśród wszystkich hospitalizowanych nie zmienił się istotnie i wynosił co roku 56-59%. W grupie pacjentów poniżej 65 lat, częstość występowania AKI była stała i wynosiła rocznie 8-11% (3-5% wszystkich hospitalizowanych w KN CMKP). Wśród pacjentów w wieku 65+ częstość rozpoznania AKI wzrastała systematycznie z 17 do 25% i stanowiła 73-82% wszystkich przypadków AKI w KN CMKP.

Wnioski. Rozpoznanie AKI u pacjentów KN CMKP było stawiane 4 razy częściej w grupie osób starszych. Częstość rozpoznania AKI rosła tylko w grupie osób w wieku lat 65 i starszych, a częstość tych rozpoznania systematycznie wzrastała.

Słowa kluczowe: ostre uszkodzenie nerek, ostra niewydolność nerek, wiek podeszły

Department of Nephrology and the Nephrology Unit, both based at the Bielański Hospital in Warsaw and working jointly, form a tertiary level nephrological service for the 500.000 local population, both urban and suburban. The service was initiated early in 2005, and after the initial period of 2 years the full range of services has been permanently available. Dialysis services were outsourced before creating the nephrological service and ever since. The alarmingly high incidence of medical patients requiring acute dialysis for acute renal failure was noticed and has not been decreasing over time. The reasons for this high demand were not clear and we hypothesized the age of the population served could contribute to it.

Acute kidney injury (AKI) is defined as an increase in serum creatinine by a minimum of 0,3 mg/dl (24.3 $\mu\text{mol/l}$) in 48 hours. It reflects a sudden onset of a prolonged reduction in glomerular filtration (GFR), which may be accompanied also by 6-12 hours oligo/anuria (1). AKI worsens the prognosis of inpatients (2), also during the post-discharge follow-up (3). The frequency of AKI in population is not well known, for hospital admissions due to the AKI represents only a minor fraction of all AKI cases, when the condition is serious enough to consider dialysis. The scarce data published so far indicate that the incidence of AKI approximates to 2100/mln, correlates with age, and is continuously growing (4), but dialysis is required in 200/mln (5). More data are available for AKI requiring hospitalization, but the admission rates vary significantly depending on the specialty of the reporting unit (6). The AKI acquired during hospitalisation (HARI – Hospital Acquired Acute Renal Injury), especially high in the ICU patients, is only a minor fraction of all AKI observed at hospitals. Since only 5% of all AKI needs dialysis (4), which remains stable over time, the aging populations would face increased demand for dialysis, and the incidence of AKI among patients admitted to the hospital renal units would increase over time. However, only limited data on AKI incidence in the elderly exists (7-10). Based on these data we hypothesised, that the number of AKI patients at our Department would grow.

AIM

Using a retrospective design of the study, we defined that it's primary objective was to verify if the frequency of AKI diagnosis among nephrology service inpatients older than 65 years of age has been growing over time. The secondary objectives were to evaluate if the trend was similar among younger inpatient medical population, and what was the relative total impact of AKI among elderly on the demand for AKI services.

MATERIAL AND METHODS

Retrospective search of the hospital database was performed to identify all medical records of patients admitted to the Department of Nephrology between January 1, 2007 and December 31, January 2011. All records with AKI as a primary or accompanying di-

agnosis were identified. The remaining records served as a control population. The yearly incidence of AKI was evaluated in patients 65 years old and older (65+), and below 65 years of age (< 65).

STATISTICS

Data were presented as fractions in yearly intervals, and the chi-square analysis served to evaluate the differences observed. The trend analysis was performed only if statistically significant difference was noted within the analysed 5 periods. All analyses were performed using standard Excell software.

RESULTS

Patients older than 65 years accounted for 56-59% of hospitalized each year, and this fraction remained stable over the analysed time ($p > 0.05$). Among patients younger than 65 the incidence of AKI ranged 8-11%, and was stable during the analysed 5-years-long period ($p > 0.05$). These patients were responsible for 3-5% of AKI in all medical patients hospitalized at the Department of Nephrology. On the contrary, in patients 65+, the AKI has been constantly growing from 17% in 2007 to 25% in 2011 ($p < 0.001$). Patients 65+ with AKI constituted the growing fraction of the hospitalized population – from 10% in 2007 to 14% in 2011 ($p < 0.01$). The 65+ group of inpatients in whom AKI diagnosis was established accounted for 73-82% of all cases of AKI, and that fraction has been steadily growing over time ($p < 0.05$).

DISCUSSION

The incidence of AKI diagnosis in the elderly has been growing over time, which has not been observed among the younger adult population. Thus, one can assume, the trend is important and responsible for the growing fraction of elderly among AKI patients. In our population the fraction of AKI patients 65+ was 2.7:1-4.6:1 as compared to those < 65. This proportion has been growing significantly over time. If this trend is to continue, within the coming 5 years we would expect that the AKI 65+ patient become 7.8 times more frequently admitted to the hospital as compared to younger adults.

It is of notice that the incidence of AKI in inpatients < 65 was stable. For the proportion of patients < 65 and 65+ remained relatively stable over time, one can assume the incidence of AKI in the inpatient population < 65 at the nephrology unit also remained stable. Furthermore, for the Department of Nephrology is the only nephrological inpatient service for the 500.000 local population and all patients < 65 presenting with AKI are admitted to the hospital, one can expect the incidence of AKI requiring hospitalization remained stable in the served population over the analysed period. This however, does not allow for any evaluation for the AKI incidence in the < 65 local population, for most cases of AKI are likely not to present at the hospital admittance.

The different trends in diagnosing AKI in medical inpatients 65+ and < 65 indicate also that the growing incidence of AKI diagnosed in the elderly medical inpatients, is unlikely to reflect changes in AKI diagnosis criteria which were made between 2006 and 2012. If it has been the case, both trends would have changed in parallel.

The nephrological service at the Bielański hospital is the only inpatient service for the local population. The number of patients migrating from this area to the neighbouring services and opposite way round, is difficult to evaluate. Taking into account that all the nephrological units in the Warsaw metropolitan area are overflowed with inpatient from the nearest population, one can expect the migrating fractions were very small and did not influence significantly the observation outcomes.

The patients presenting at the Bielański Hospital with AKI, or developing HARI are also hospitalized in nonnephrological medical wards of cardiology, gastroenterology, and internal medicine. This is why our analysis cannot be representative to the total inpatient population, but reflects mainly the most advanced cases of AKI – the acute renal failure (ARF), often requiring dialysis. It is very unlikely the ARF medical patient is not treated at our nephrological unit, if not from the admittance than following the in-hospital transfer.

This is why we believe the data collected were correct, complete, and representative for the AKI stage II onward.

This is the very first analysis of all data gathered, in which we were interested mainly in evaluating global trends at the nephrological unit. Thus, not all AKI patients from the local population were included. Out of our analysis remained patients from surgical and ICU wards. It is also probable that some patients with AKI were misplaced, for the diagnosis of AKI was omitted in records. We based our evaluation on administrative data, not on the laboratory nor clinical findings.

We are very aware the retrospective design of our study includes all the flaws typical to it. The AKI patients were identified from administrative database, which means the observed fractions are likely to be underestimated. However, the proportion of patients < 65 and 65+ was stable over the observed interval, and thus the underestimation is very likely to be similar in both age groups. Thus, the relative changes over time in < 65 and 65+ should be parallel if not influenced by external factors. We believe the data indicate that the only factor responsible for differences observed in diagnosing AKI in the elderly nephrological inpatient population was the true increase in AKI incidence in the population aged 65 years of age and more. In conclusion – the incidence of AKI is on the rise in the elderly, who already are the predominant AKI renal services' inpatients.

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