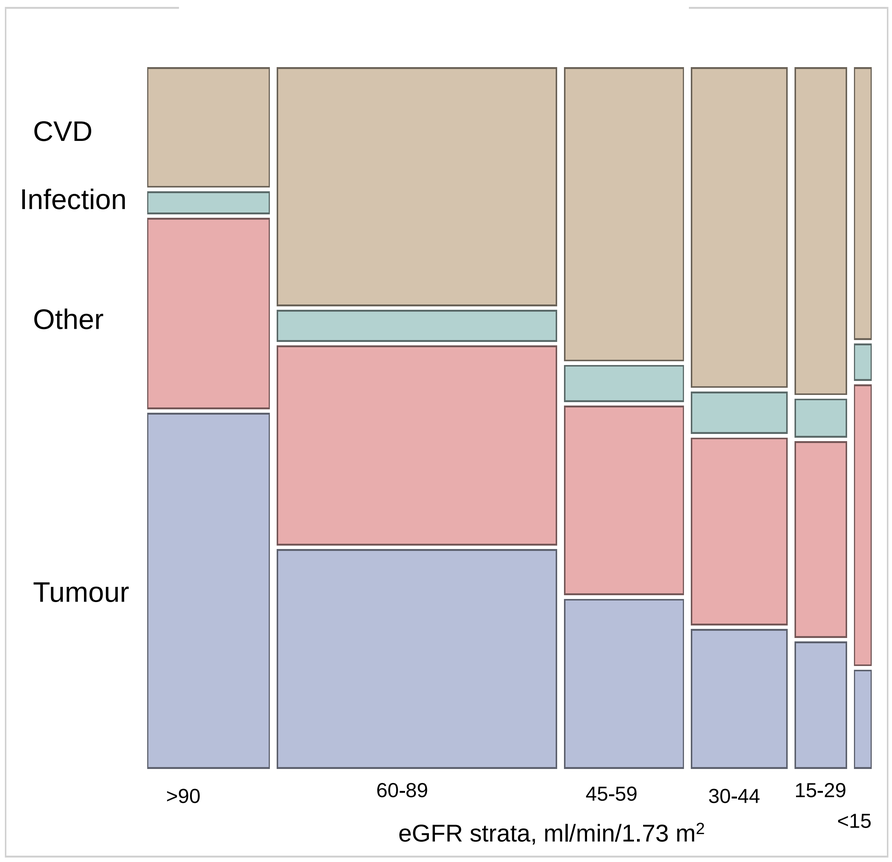
Causes of death across reduced kidney function; The Stockholm CREAtinine Measurement (SCREAM) project

Björn Runesson, Abdul R Qureshi, Alessandro Gasparini, Marie Evans, Peter Barany, Björn Wettermark, Carl G Elinder and Juan J Carrero.
Division of Renal Medicine (CLINTEC) and Department of Medical Epidemiology and Biostatistics (MEB), Karolinska Institutet, Sweden



Unadjusted relative percentages the four main categories of death by eGFR strata

Introduction

Reduced kidney function increases death hazards, but there is limited information on causes of death across CKD stages. The purpose of this analysis is to identify leading causes of death in community-dwelling individuals with differing kidney function

Methods

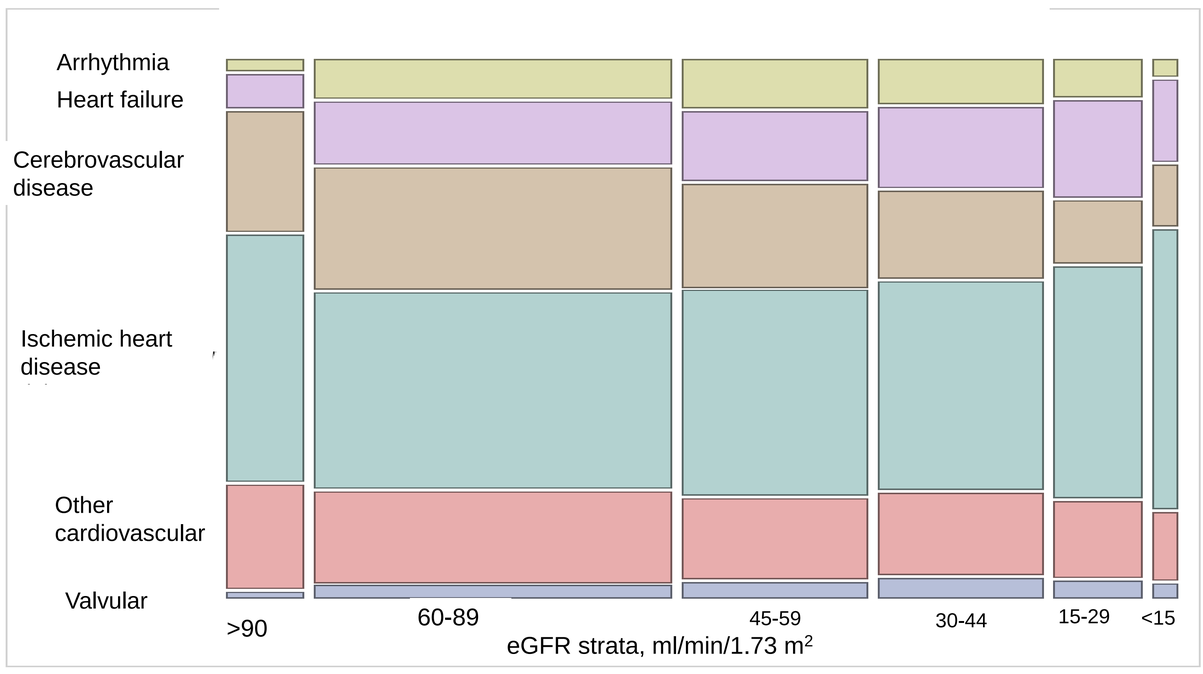
We used the Stockholm CREAtinine Measurement Project (SCREAM), a complete healthcare utilization cohort of the region of Stockholm, Sweden. Included were all individuals who died between 2006 and 2012, and had at least one serum creatinine measured in the year prior to death. Using the CKD-EPI formula, we calculated the eGFR closest to the date of death and stratified individuals according to CKD stages. Cause of death was classified as cardiovascular, infection, cancer and other, using International Classification of Diseases codes. Age- and sex-adjusted differences in the proportions of deaths from each cause according to the severity of CKD were compared.

Participant Characteristics	Overall	Death attributed to			
		CVD	Cancer	Infection	Other
N (%)	70,547 (100)	25,216 (35.7)	21,941 (31.1)	3250 (4.6)	20,140 (28.6)
Age, years (median, 10th-90th p)	82 (62-93)	86 (69-94)	75 (57-88)	83 (60-93)	84 (62-94)
Women, N (%)	36,878 (52.3)	13,573 (53.8)	10,649 (48.5)	1,612 (49.6)	11,044 (54.8)
Diabetes, N (%)	12,855 (18)	4,946 (19.6)	3,407 (15.5)	639 (19.7)	3,863 (19.2)
Charlson score (median, 10th-90th p)	2 (0-8)	2 (0-5)	5 (1-9)	2 (0-5)	2 (0-5)
eGFR strata, ml/min /1.73 m2					
>90 , N (%)	12,538 (17.8)	2,171 (8.6)	6,503 (29.6)	396 (12.2)	3,468 (17.2)
60-89 , N (%)	28,937 (41.0)	10,046 (39.8)	9,213 (42)	1,241 (38.2)	8,437 (41.9)
45-59 , N (%)	12,260 (17.4)	5,227 (20.7)	3,016 (13.8)	652 (20.0)	3,365 (16.7)
30-44 , N (%)	9,868 (14.0)	4,603 (18.3)	2,001 (9.1)	582 (17.9)	2,682 (13.3)
15-29 , N (%)	5,229 (7.4)	2,488 (9.9)	965 (4.4)	292 (9.0)	1,484 (7.4)
ESRD	1,715 (2.4)	681 (2.7)	243 (1.1)	87 (2.7)	704 (3.5)

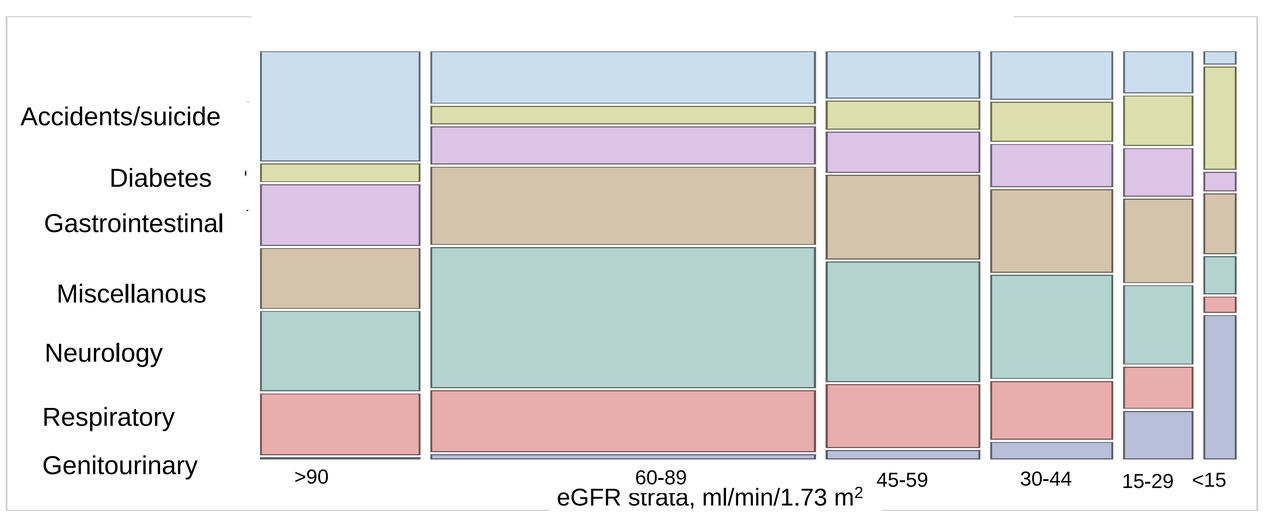
Table 1. Participant characteristics

Conclusion:

In this region region-representative healthcare extraction, causes of death varied significantly with stages of kidney dysfunction: With lower eGFR, cardiovascular disease was the main cause of death, attributed to an increased proportion of ischemic heart disease, arrythmia and heart failure. Deaths due to diabetes and genitourinary disease also increased, while cancer became a less common cause of death with lower eGFR. Increased awareness of this differential pattern of risk may have benefits for patient management, prevention strategies and health service planning.



Unadjusted relative percentages of cardiovascular causes of death by eGFR strata



Unadjusted relative percentages of other causes of death by eGFR strata

Results

Out of 89.117 registered deaths, 70.547 (79%) had a recent GFR estimation and were included in the study. Median age was 82 (IQR 62-93) years and 52% were women. The proportions of deaths from CVD increased with lower eGFR, along with the proportions of deaths from infections. The proportion of deaths from cancer decreased. Within CVD-related deaths, ischemic heart disease was the most common across all eGFR strata. Fatal arrhythmia increased from 2.1% in eGFR>90 to 9.4% in eGFR 45-59 ml/min, and heart failure increased from 6.3% in eGFR>90 to 18.3% in eGFR 15-29 ml/min. Deaths attributed to cerebrovascular disease, however, decreased (from 23% in eGFR>90 ml/min to 11.5% in ESRD). Death due to diabetic complications, genitourinary diseases and other causes causes became increasingly common in individuals with lower eGFR.

Karolinska Institute
Björn Runesson
MD, PhD-student

E-mail: bjorn.runesson@.ki.se
Telephone: +46 (0)8 524 863 29

Karolinska Institutet

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Bjrn Runesson
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