SECTION K MORTALITY

The cause, location and circumstances of death of patients treated by RRT in Scotland who have died since 01 January 2008 are collected as part of the Scottish Mortality Audit of Renal Replacement Therapy (SMARRT).

Cause of death has been coded in accordance with ERA-EDTA codes and then aggregated into six groups: cardiovascular, infection, RRT complication, treatment withdrawal, malignancy and other causes of death.

For the death of every patient their clinician has also considered the circumstances of death and recorded the presence or absence of areas of clinical concern in patient management prior to death.

A five point scale is used:

1 There were no areas of concern or for consideration in the management of this patient

2 There were areas for consideration but they made no difference to the eventual outcome

3 There were areas of concern but they made no difference to the eventual outcome

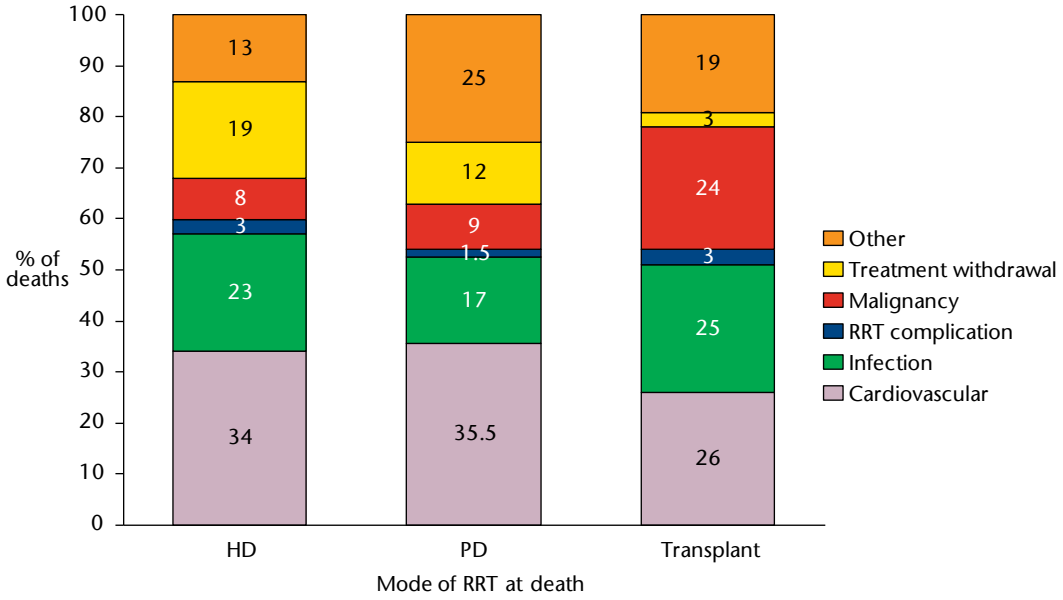
4 There were areas of concern which may have contributed to this patient's death

5 There were areas of concern which CAUSED the death of this patient who would have been expected to survive

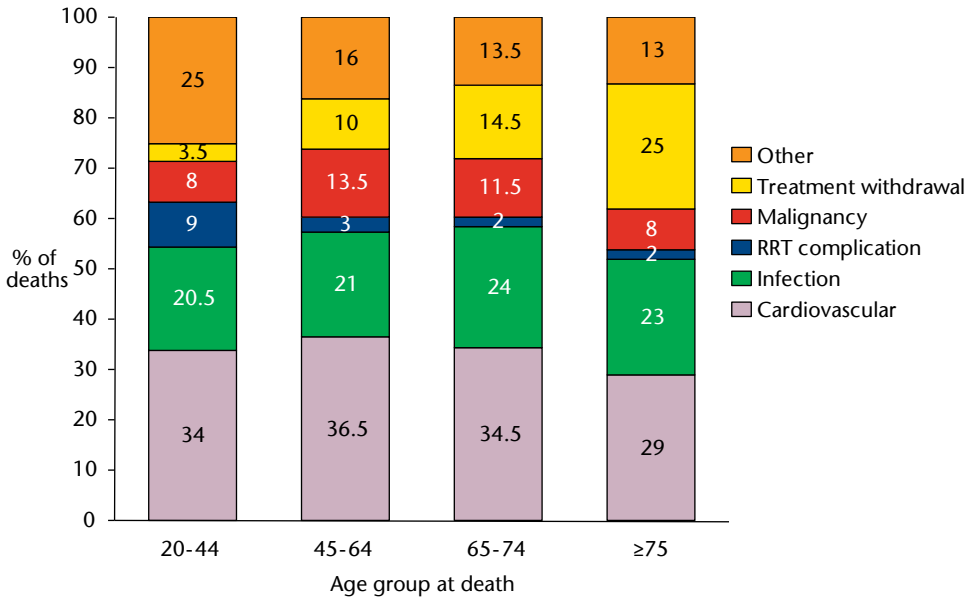
A complete list of the ERA-EDTA cause of death codes, SMARRT groupings and the SMARRT data collection form are available on the SRR website: http://www.srr.scot.nhs.uk/Projects/Projects2.html#mortality

Between 01 January 2008 and 31 December 2012 there were 2172 deaths among RRT recipients. This represents 8.0-11.0% of the prevalent RRT population per year. Cause of death data are available for 2136 (98%) and information on the location of death for 2099 (96.5%). Data on the circumstances leading to death are available for 2148 patients (98.8%).

K1 Cause of death and modality of RRT at death 2008-2012



K2 Cause of death and age at death 2008-2012



K3 Location of patient death 2008-2012		
Location	**Number of patients**	**Percentage of patients**
Usual place of residence	483	22.2
Hospital	1500	69.0
Hospice	43	2.0
Community hospital	47	2.2
Place of death unknown	26	1.2
Data missing	73	3.4
Total	**2172**	**100**

K4 Percentage of deaths 2008-2012 in each category of concern by renal unit							
Unit	**Category 1**	**Category 2**	**Category 3**	**Category 4**	**Category 5**	**Missing**	**Deaths (n)**
ARI	93.0	5.5	0.5	0.5	0	0.5	199
XH	97.5	2.5	0	0	0	0	166
DGRI	88.4	4.3	0	3	4.3	0	69
GLAS	83.6	10.1	1.9	3.8	0.6	0	703
MONK	93.9	2.5	1.8	1.2	0.6	0	163
NINE	79.3	10.1	3.0	7.6	0	0	237
RAIG	80.7	10.9	0	2.5	1.7	4.2	119
RIE	69.6	23.1	3.8	3.5	0	0	372
VHK	77.1	6.9	0	3.5	0.7	11.8	144
Scotland	**83.0**	**10.4**	**1.7**	**3.3**	**0.5**	**1.1**	**2172**

It is recognised that the degree of clinical concern highlighted in the SMARRT process is potentially subjective and open to inter-unit variation. Currently, all units hold regular consultant led meetings at which deaths are discussed. Three units (MONK, RAIG, RIE) currently attribute the degree of clinical concern as a group, however this was not the case for the entire duration of the study reported here. In the remainder the decision is at the discretion of the clinician in charge of the patient's care.

K5 Frequency of areas of concern in management which may have or did contribute to death 2008 - 2012		
Theme	**Category 4 deaths**	**Category 5 deaths**
Hyperkalaemia	3	1
Prescribing	11	2
Systems of care	18	1
Infection	25	2
Vascular access	7	3
Intervention	5	2
Other	2	0
Total	**71**	**11**

Where the management of the patient was categorised as 4 or 5 further details of the circumstances of death were obtained. For deaths occurring in 2008 and 2009 this was by case note review by a group of consultant nephrologists. For deaths occurring 2010 - 2012 further details were obtained via records of each renal unit of morbidity and mortality meetings, critical incident review reports or procurator fiscal reports.

From analysis of this additional information several themes emerged which either contributed to or caused death in more than one patient. These themes were:

1. **Hyperkalaemia.** Death due to hyperkalaemic arrest. Patient non-concordance with treatment was felt to contribute in 50% of cases.
2. **Prescribing.** Death attributed to adverse drug effects - inappropriate drug choices, combinations or monitoring. Examples include combined use of allopurinol and azathioprine leading to pancytopenia, inappropriate dosing or monitoring of opioids and continued immunosuppressant drugs in a patient with a failed transplant leading to fatal sepsis.
3. **Systems of care.** Deaths attributed to failures of communication, inadequate of out of hours cover, delays in specialist renal input or inadequate staff training.
4. **Infection.** Deaths attributed to severe infection due to delays in recognition/management, immunosuppressive drugs or vascular access.
5. **Vascular Access.** Deaths attributed to fatal blood loss from vascular access (intentional and accidental), inadequate dialysis following failure to address poor vascular access or cardiovascular compromise from AVF formation.
6. **Interventions.** Deaths attributed as a direct consequence of an operation or procedure. Includes bleeding post angiography and an arrest during a tunnelled central venous catheter insertion.
7. **Other.** Death following a fall-related fracture sustained whilst at or travelling to a dialysis session.