

# Timing and parameter for renal replacement therapy initiation in critically ill patients with acute kidney injury

Ratanarat R, Panyavachiraporn N, Surattichaiyakul B

Department of medicine, Faculty of Medicine, Siriraj Hospital, Mahidol University, Bangkok, THAILAND

## OBJECTIVES

**Background:** To date, acute kidney injury requiring renal replacement therapy (RRT) is the major problem in critically ill patient and the mortality remains high despite the advance in RRT technique. To improve survival outcome, optimal timing for initiation of RRT were studied and found that early may be better than late initiation<sup>1</sup> but the triggering parameter and optimal cut-off point still remain questionable<sup>2</sup>.

**Table 1: Baseline characteristics at ICU admission according to 28-day mortality**

	Survivor (n=84)	Non-survivor (n=108)	P value
Age (years)	63 ± 17	55±17	0.003
Sex (male %)	58.3	61.1	0.767
Baseline creatinine (mg/dl)	1.32 ± 0.68	1.14±0.59	0.044
APACHE II score	21 ±4	21 ±6	0.672
Mechanical ventilation (%)	95.2	98.1	0.41
ARDS(%)	15.5	33.3	<0.001
Inotropic drug use (%)	85.7	95.4	0.02
Indication for RRT:			
Conventional	19%	31%	0.068
Renal support	81%	68%	

**Table 2: Patients' parameters at time of RRT initiation**

	Survivor (n=84)	Non-survivor (n=108)	P value
APACHE II score	20 ± 4	22 ± 5	0.004
BUN(mg/dl)	80 ± 33	71 ± 36	0.09
Creatinine(mg/dl)	5.6 ± 3	4.1 ± 2.2	<0.001
K(mEq/L)	4.4 ± 1	4.6 ± 1	0.108
HCO <sub>3</sub> (mEq/L)	13.4 ±6.3	13.8 ± 5.5	0.682
24hr urine output (ml/kg/hr)	0.21 (0, 2.4)	0.33 (0, 4.5)	0.402
6hr urine output (ml/kg/hr)	0.26 (0, 20.8)	0.08 (0, 2.1)	0.042
Timing to RRT (hr)	7.4 (0.7, 168)	10.5 (0.7, 252)	0.775
Fluid accumulation (%)	7.45 (-4.8, 54.8)	13.2 (-4.8, 86.6)	<0.001
ICU fluid accumulation(%)	1.27 (-7.1, 39.5)	4.37 (-0.4, 51.7)	0.003

## METHODS

Retrospective observational study was conducted in the medical intensive care units (ICU) of a university hospital during 2008-2011. Clinical parameters that associated with 28-day mortality were identified, and the significant parameters then were analyzed using the area under ROC (aROC) curve for searching the cut-off value to define early and late initiation of RRT.

## RESULTS

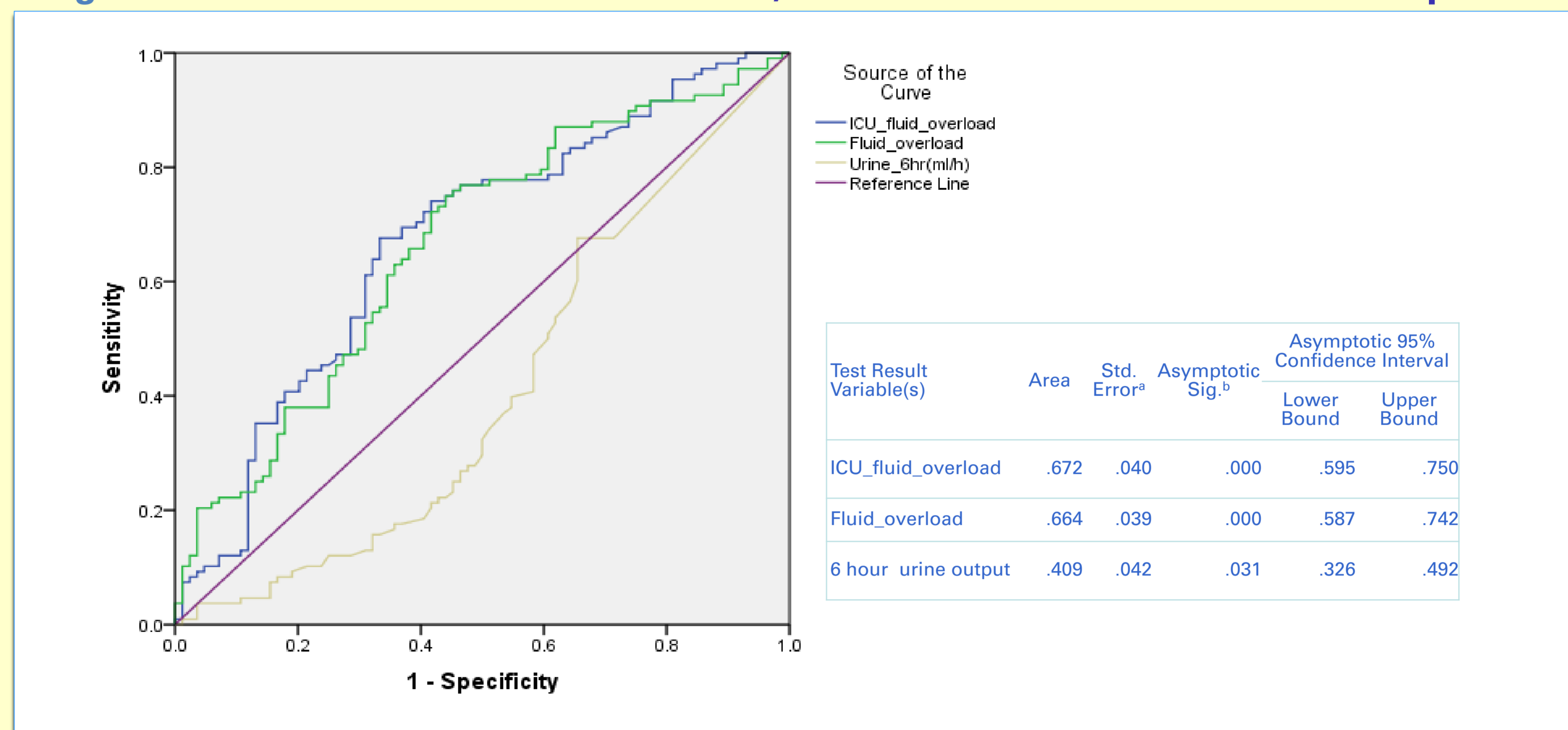
### Patients' characteristics

192 patients undergoing RRT were included. The baseline characteristics of the study subjects assorted according to 28-day outcome are shown in Table 1 and patients' parameters at time of RRT initiation are shown in Table 2

### Parameters associated with 28- day mortality

Parameters that associated with 28-day mortality including **average 6-hour urine output before RRT start, total fluid accumulation during hospital stay and fluid accumulation during ICU stay** were analyzed using aROC curve to demonstrate cut-off values of each parameter as shown in Figure 1.

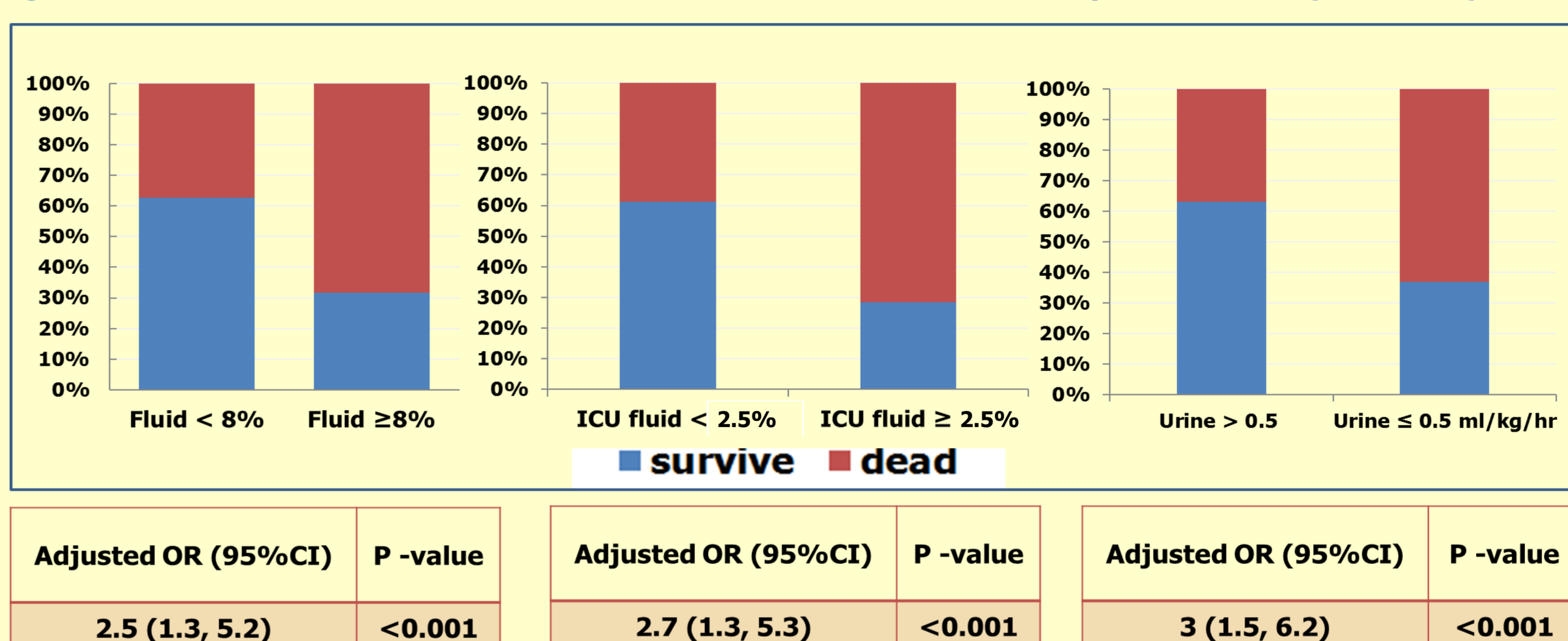
**Figure1: ROC curve of ICU fluid overload, fluid overload and 6-hour urine output**



### Cut-off value for early initiation using aROC curve

Fluid accumulation of more than 8% during hospital stay and 2.5% during ICU stay associated with increased 28-day mortality. Average urine output 6 hours before RRT of less than 0.5ml/kg/hours could predict 28-day mortality as demonstrated in Figure2.

**Figure2: Fluid accumulation, ICU fluid accumulation, 6-hour urine output and 28 day mortality**



## CONCLUSIONS

Degree of fluid accumulation during hospital stay, also ICU stay and average urine output 6 hours before RRT initiation were associated with 28-d mortality. Fluid accumulation of more than 8 % during hospital stay, 2.5% during ICU stay and urine output of less than 0.5 ml/kg/hr might be used as cut-off values for early RRT initiation. However , the larger RCT trials should be conducted to validate these parameters.

## REFERENCES:

1. Wierstra BT, Kadri S, Alomar S, et al. The impact of "early" versus "late" initiation of renal replacement therapy in critical care patients with acute kidney injury: a systematic review and evidence synthesis. Crit Care. 2016; 20:122.
2. Wald R, Bagshaw SM. The Timing of Renal Replacement Therapy Initiation in Acute Kidney Injury. Semin Nephrol. 2016; 36:78-84.