**Additional File 1.** Summary of path-analysis modelling strategy.

**Afterhours ICU Admission**

**ICU Mortality**

**Admission APACHE II Score**

The simulation process for ICU mortality was done using R package and this diagram. The simulation process for ICU mortality within 30 hours, 3 days or 7 days as well as hospital mortality was done similarly.

After modeling, we extracted three pairs of parameters (estimate, standard error), which were used to describe the direct and indirect associations from after-hour admission on ICU mortality. In detail, we used normal distribution to describe the direct association between afterhours ICU admission and ICU mortality, and and to describe the indirect association. We did a simulation with 1 million replications to calculate integrated effect using the following algorithm:

Algorithm for estimating the integrated effect of afterhours ICU admission.

*Initialize:* Assign.

*Iterate:* Repeat step 1-2 one million times

Step 1 created three random numbers from the three normal distributions, i.e. .

Step 2 calculate indirect effect and integrated effect

*Summarize:* calculate coefficient estimate (mean), SE (standard error), p-value (two sided), OR (odds ratio) and 95% CI (confident interval) of indirect/integrated effect from simulated one million indirect/integrated effect values.