

**An economic analysis of intensive care and
the time after survival:
it may be not cost-effective to save at the
wrong end**

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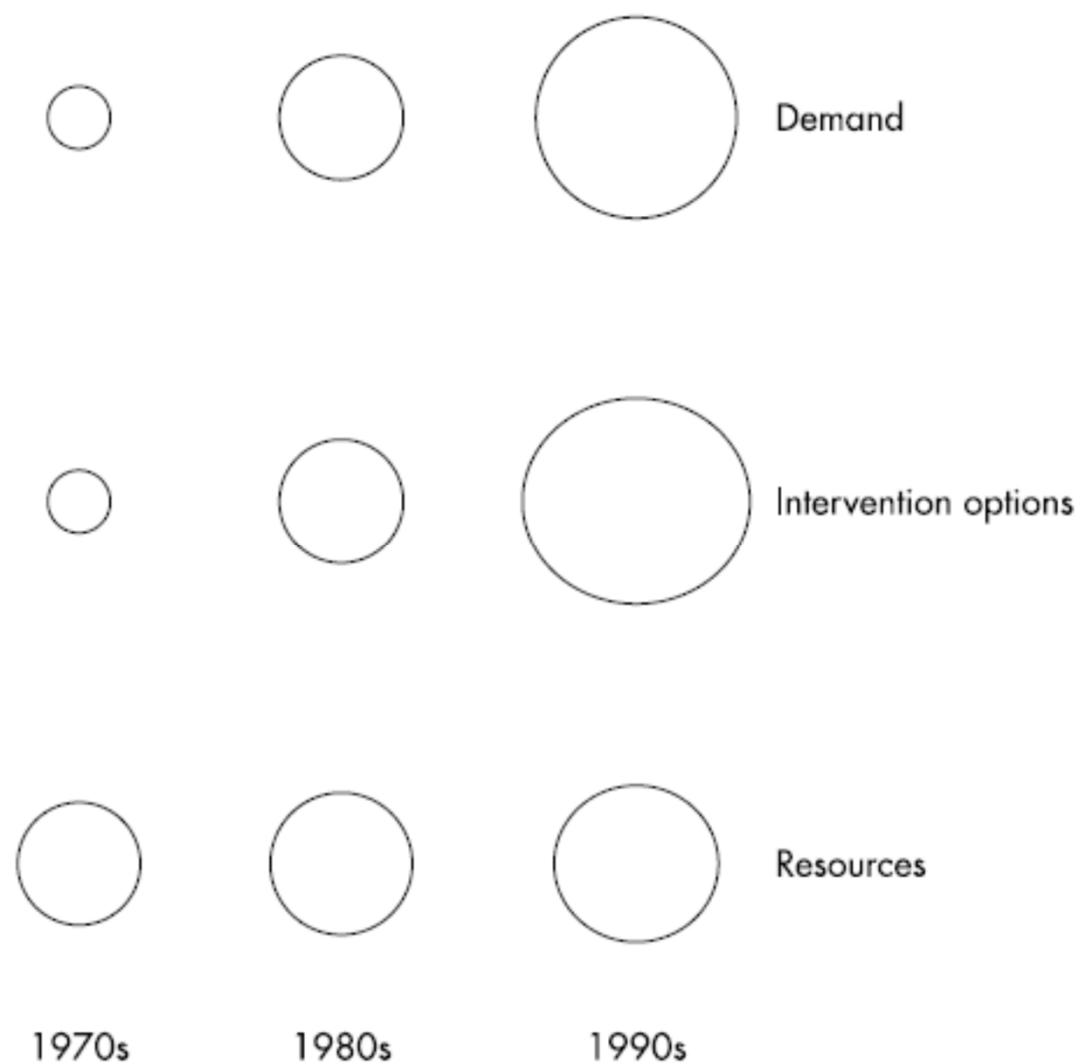
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(WHO Collaborating Centre for Health Systems Research and Management)

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European Observatory on Health Systems and Policies

Why economic evaluation?



ICUs are growing in absolute and relative terms (here in Germany)

	2005	2010	2015
All acute care hospitals	1846	1758	1619
Hospitals with ICU beds	1299	1247	1156
% of all hospitals	70%	71%	71%
Hospitals with ICU department	434	433	414
% of all hospitals	24%	25%	26%
All acute care beds (x 1000)	485	462	454
ICU beds (x 1000)	23	25	27
% ICU of all beds	4.7%	5.4%	5.9%

... 1 in 9 inpatients is treated in ICUs,
with 1 in 16 bed days provided there

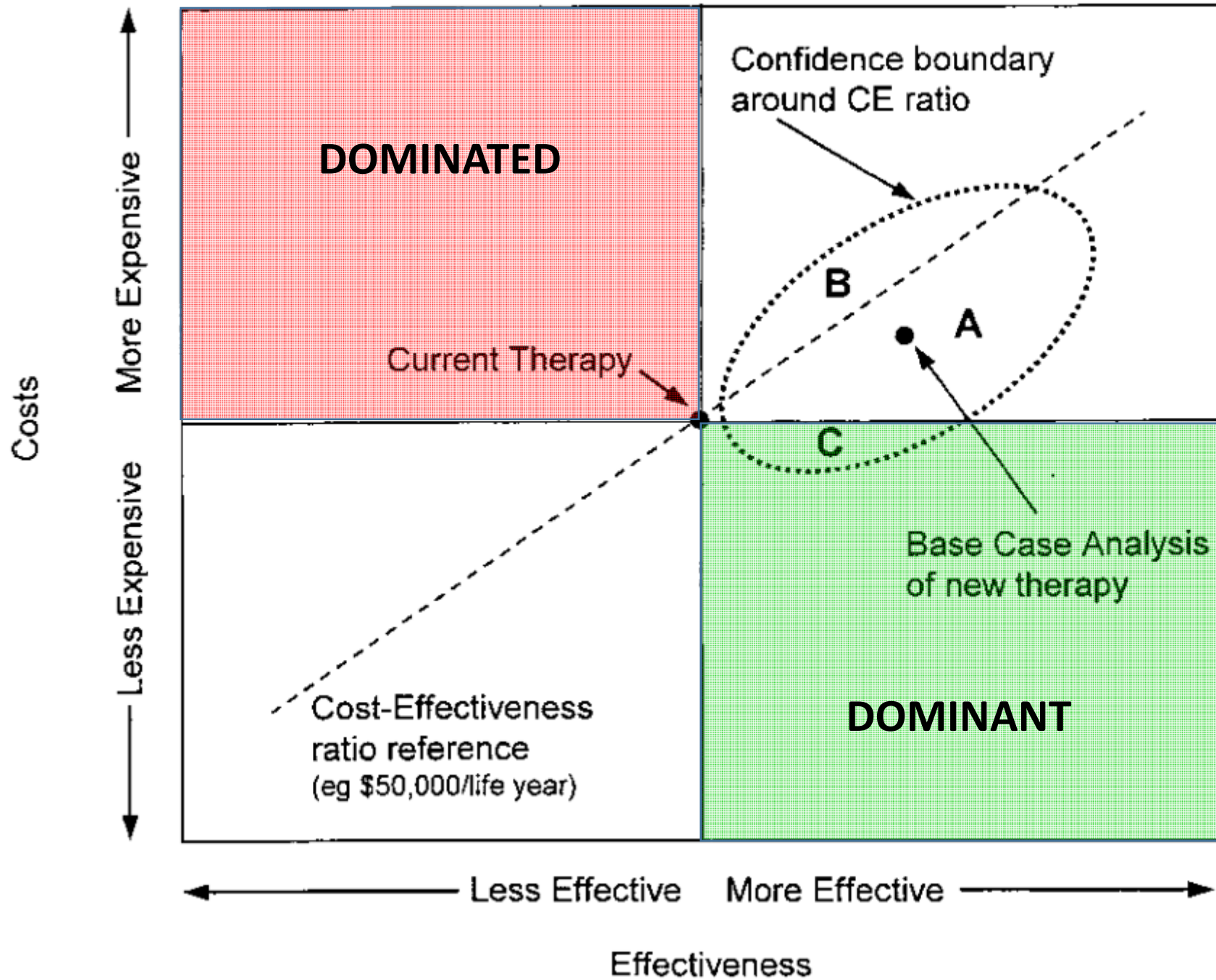
	2005	2010	2015
Alle acute care cases (x 1000)	16 379	17 486	18 614
Cases with ICU use (x 1000)	1960	2050	2142
% ICU of all cases	12.0%	11.7%	11.5%
Cases with ventilation in ICU (x 1000)	307	359	412
% ventilated of ICU cases	15.7%	17.5%	19.2%
% ventilated of all cases	1.9%	2.1%	2.2%
Alle acute care bed days (x 1000)	131 892	128 380	125 979
ICU bed days (x 1000)	6687	7387	7999
% ICU of all bed days	5.1%	5.8%	6.3%
Average length of stay ICU (days)	3.4	3.6	3.7

And ICU care is costly (especially if patient is ventilated)

- In Germany, an ICU day costs 2.5x as much as on normal wards (in Canada: 3x),
- i.e. ICUs are responsible for 13.5% of inpatient costs –
> € 10 000 000 000 (or 0.4% of GDP)

But how do we evaluate whether ICUs are worth the € 10 billion?

In theory, it's (relatively) simple ...



... in practice, much more difficult as we have to address:

P	Patients/ population: <i>who?</i>
I	Intervention: <i>what?</i>
C	Control: <i>against what?</i>
O	Outcomes: <i>what is important? when and how to measure?</i>

P	<p>How do we define the patient group potentially benefitting from ICU care? It is clear, it cannot be simply the patients being admitted to ICU. Rather we have to define them more specifically, e.g. as having a severe sepsis, a cardiac arrest or an acute respiratory failure and/or a score with e.g. APACHE above a certain threshold.</p>
I	<p>What is the actual “intervention” when we talk of ICU? Intensive care is a “complex intervention”, i.e. consisting of a variety of interventions, many of which could also be provided outside an ICU (e.g. ventilation). While many cost-effectiveness studies base their intervention on individual interventions, the core definition should be best based on the availability of both personnel and certain technologies.</p>
C	<p>Who is the control group? In usual economic evaluations, this is “usual care”, “best available care” and/or “least costly care”, of course not using the intervention of interest, i.e. for patients with an acute respiratory failure this would mean withholding ventilation.</p>
O	<p>What should be the outcome of interest? Survival in the short-term, mortality after one year or even longer? And optimally the necessity of continuous therapy and/or quality of life of the patient should be taken into account, i.e. a patient still requiring ventilation at home would count “less”, thus making the intervention less cost-effective.</p>

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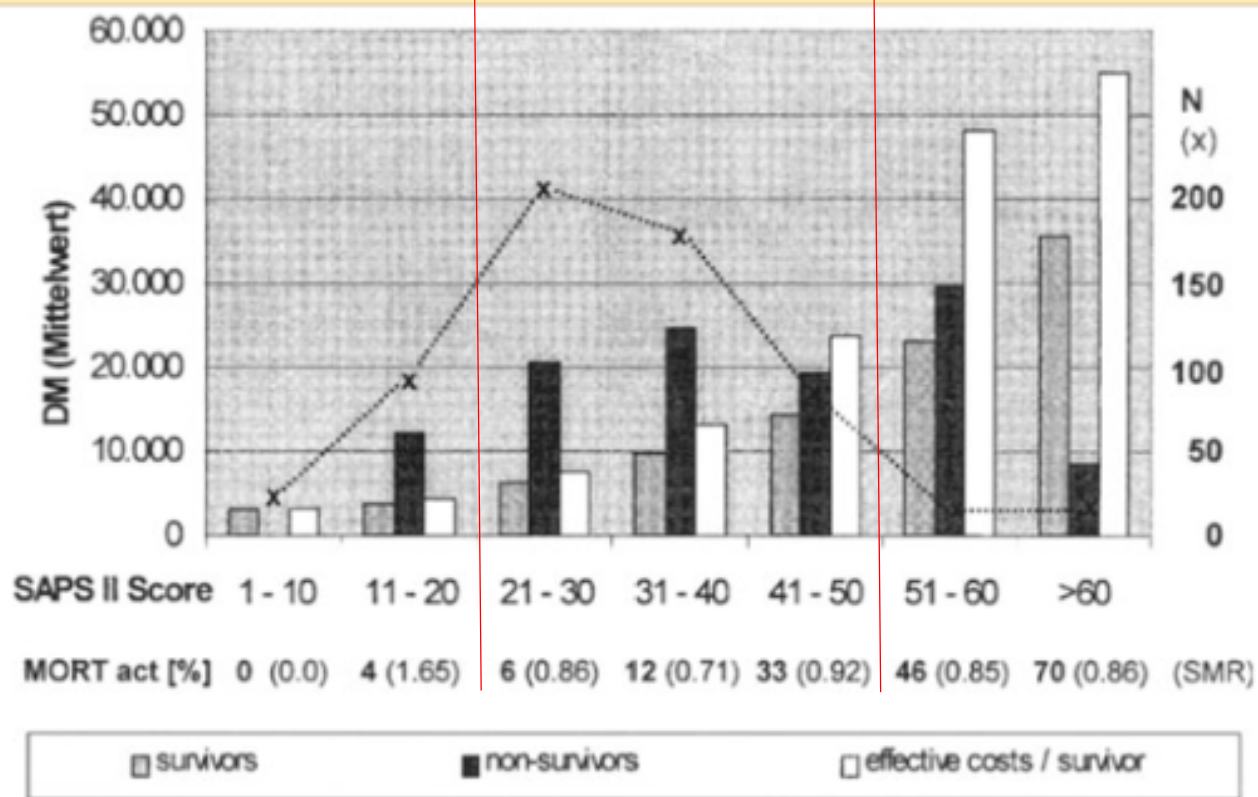
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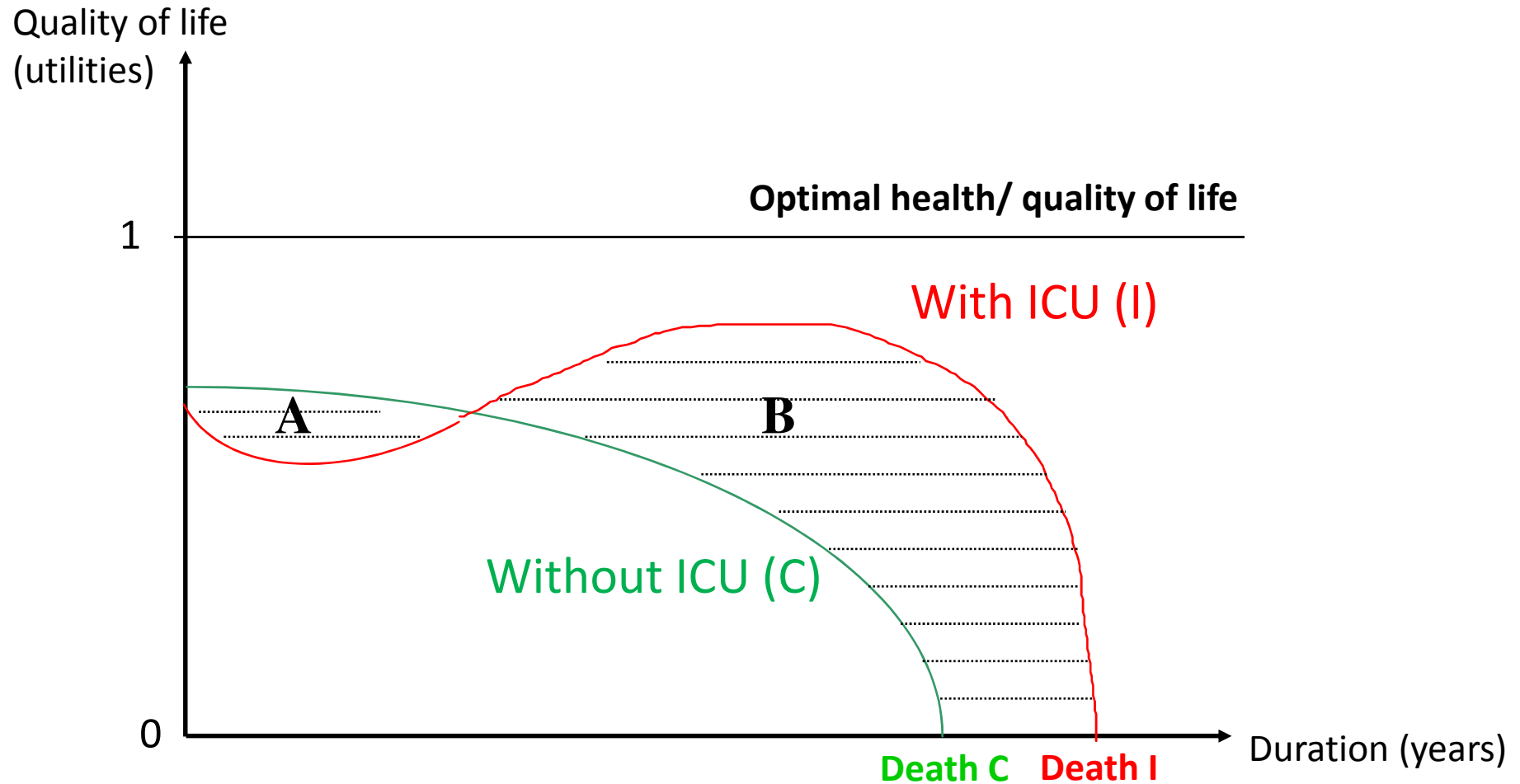
An early economic evaluation – limited to within ICU (outcome: survival)

Relatively cheap
but possibly not indicated
(not better than normal ward)

Expensive, whether this is
“worth the money” depends on
societal values and post-ICU outcomes



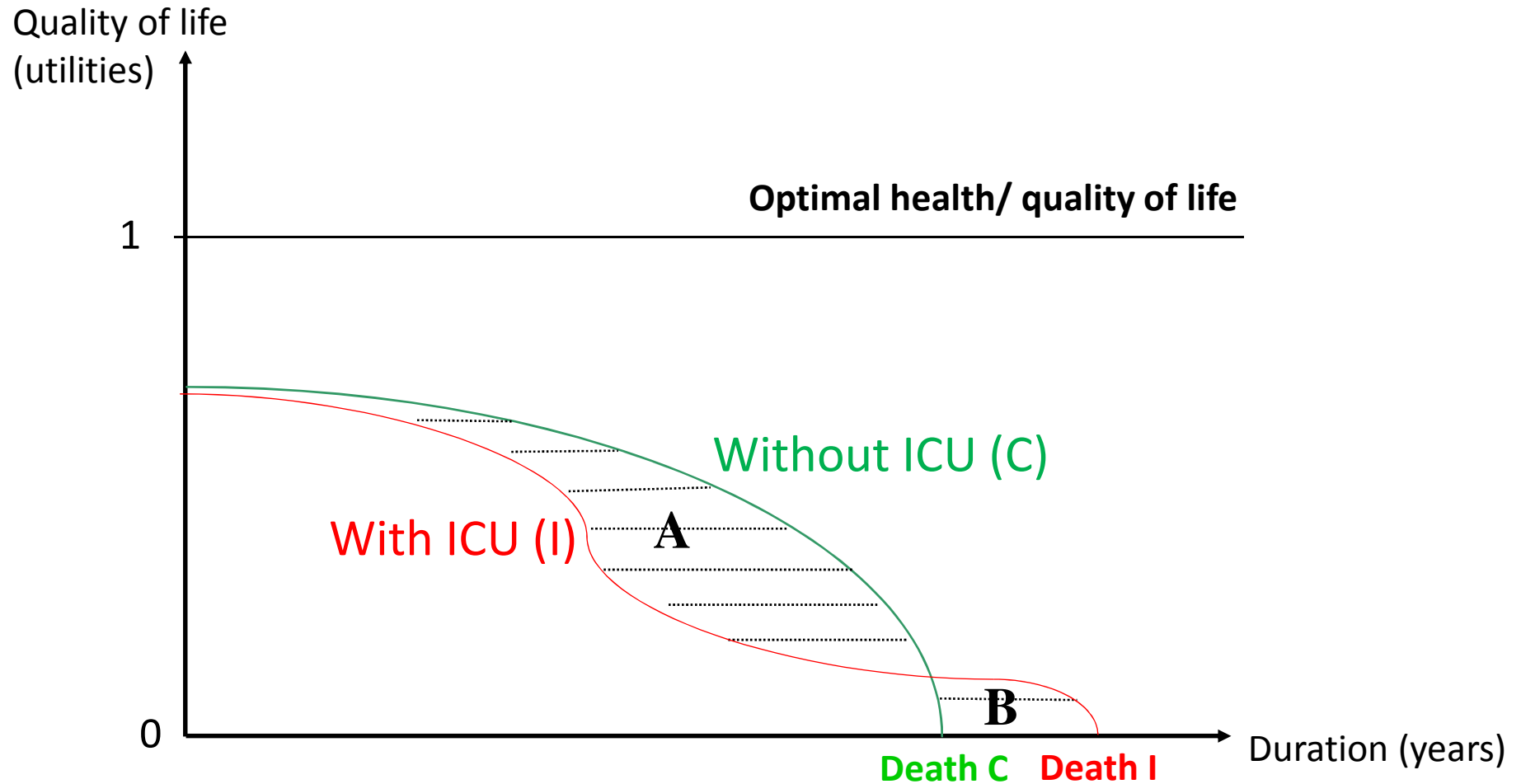
Including post-ICU time (and quality of life), an optimal curve would look like this ...



Gained years :
Death I – Death C

Gained QALYs :
B (additional QALYs) – A (lost QALYs)

... but it could look like this
(with only a small or no QALY gain)



Gained years :
Death I – Death C

Lost QALYs :
B (additional QALYs) – A (lost QALYs)

Some examples to demonstrate variability in cost-effectiveness ratios

	P	I	C	Cost-effectiveness
Mayer et al. 2000	Hospitalized with stroke	Mechanical ventilation	No mechanical ventilation	\$ 174 200/ QALY
				\$ 37 600/ year
Manns et al. 2002	Severe sepsis, APACHE \leq 24	Administration of activated protein C	Conventional care	\$ 958 423/ QALY
	Severe sepsis, APACHE \geq 25			\$ 32 872/ QALY
Kerridge et al. 1995	Admitted for asthma	ICU	Standard ward	\$ 282/ QALY
	Admitted for trauma	ICU	Standard ward	\$ 2632/ QALY
	Admitted for vascular surgery	ICU	Standard ward	\$ 3494/ QALY

In summary,

- given the high costs of ICUs and the uncertainty about long-term outcomes, economic evaluation of ICU care is necessary,
- but how to do it requires a careful definition of P-I-C-O.
- ICU care can be – depending on which patients we look at, which outcomes we consider, and how long we look post-ICU – highly cost-effective,
- but we need more evaluation on the exact patients groups and the kind of ICU intervention(s) needed.

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