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Improving the Outcome Prognostication of Critically Ill Patients with Moderate-Severe TBI

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Improving the Outcome Prognostication of Critically Ill Patients with moderate-severe TBI

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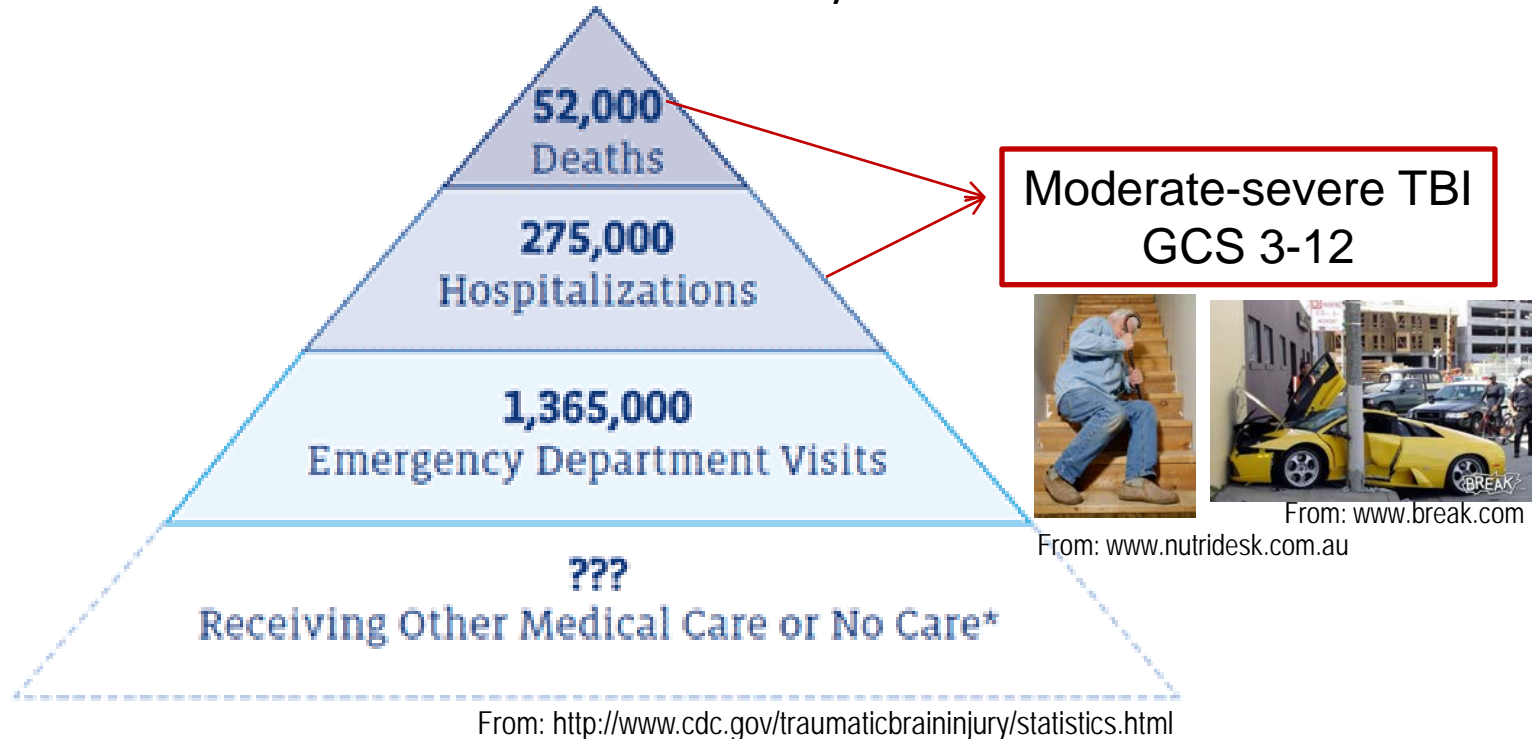
Disclosures

- No conflict of interest
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 - American Heart Association AHA 09SDG2030022
 - Worcester Research Foundation 2010
 - Faculty Scholar Award 2011
 - Departmental



Traumatic Brain Injury remains a real public health problem in the U.S. (and worldwide).

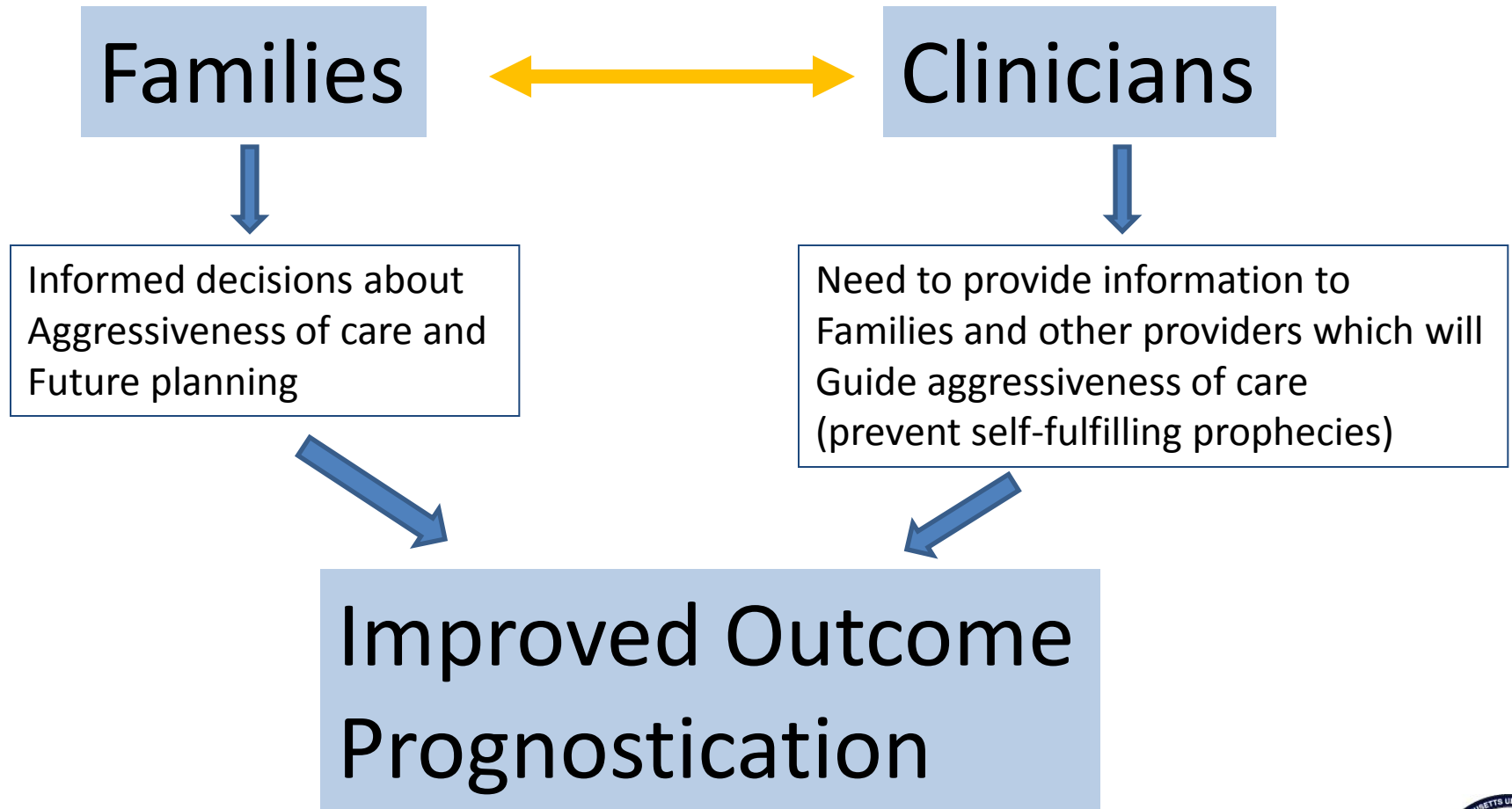
Appr. 1.7 million Americans sustain a TBI annually



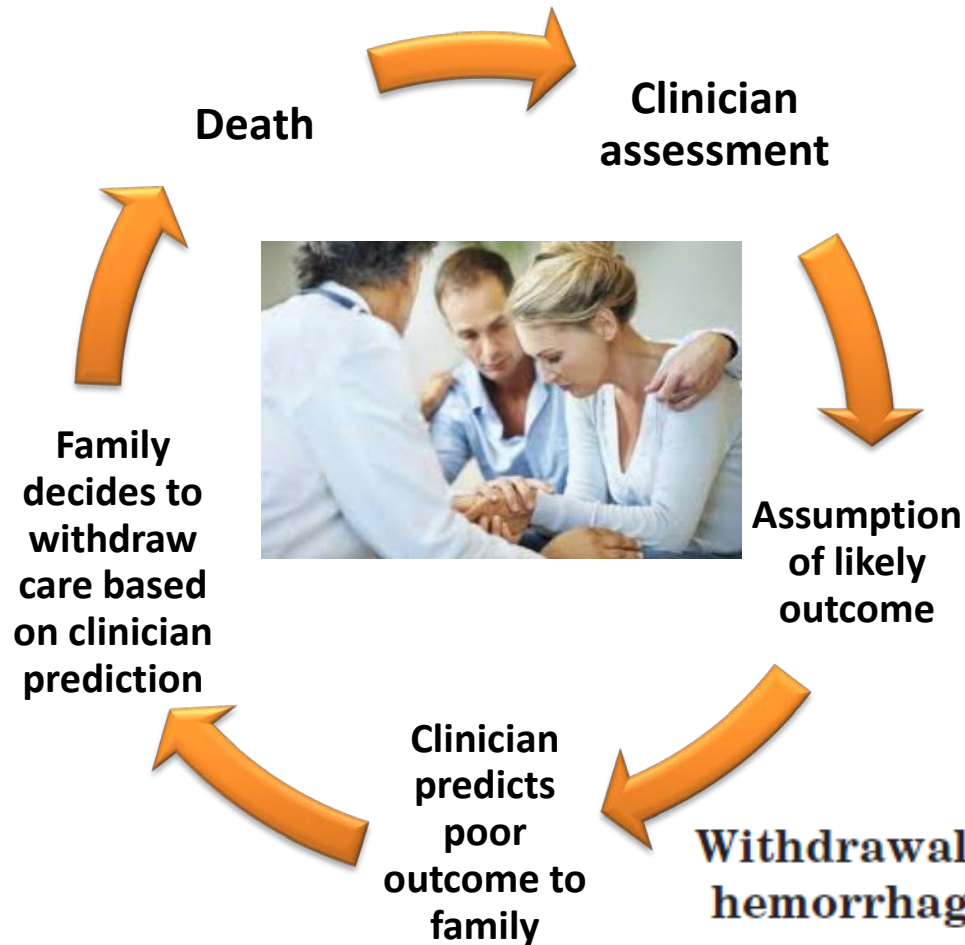
- 25% of these are moderate-severe TBI.



Outcome prognostication is extremely important for families and clinicians.



Withdrawal of Care may lead to self-fulfilling prophecies.



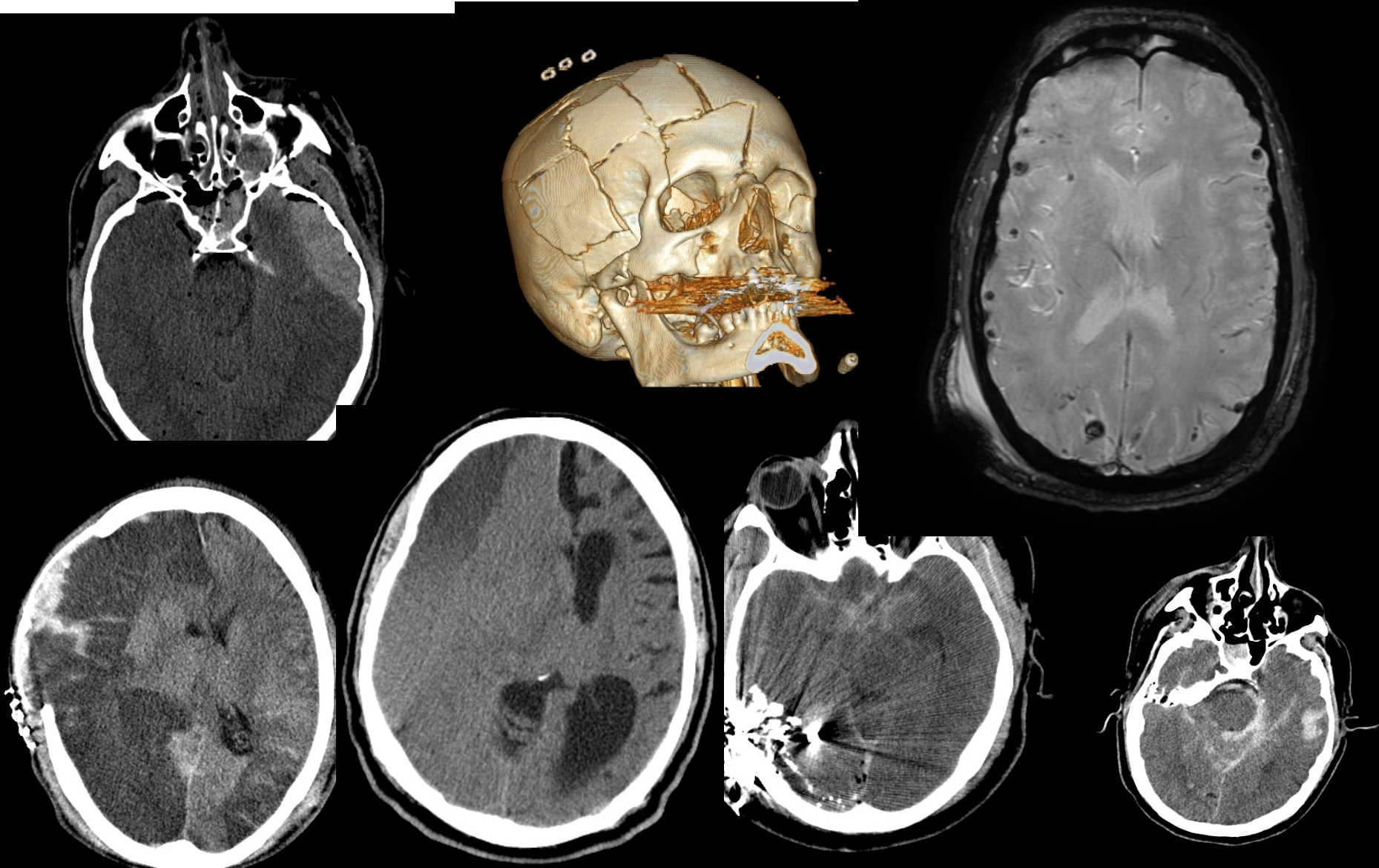
Withdrawal of support in intracerebral hemorrhage may lead to self-fulfilling prophecies

K.J. Becker, MD; A.B. Baxter, MD; W.A. Cohen, MD; H.M. Bybee, BSN; D.L. Tirschwell, MD, MSc; D.W. Newell, MD; H.R. Winn, MD; and W.T. Longstreth, Jr., MD

Becker et al. Neurology 2001



TBI is a heterogeneous disease, making outcome prognostication difficult.



The outcome prediction in TBI is complex.

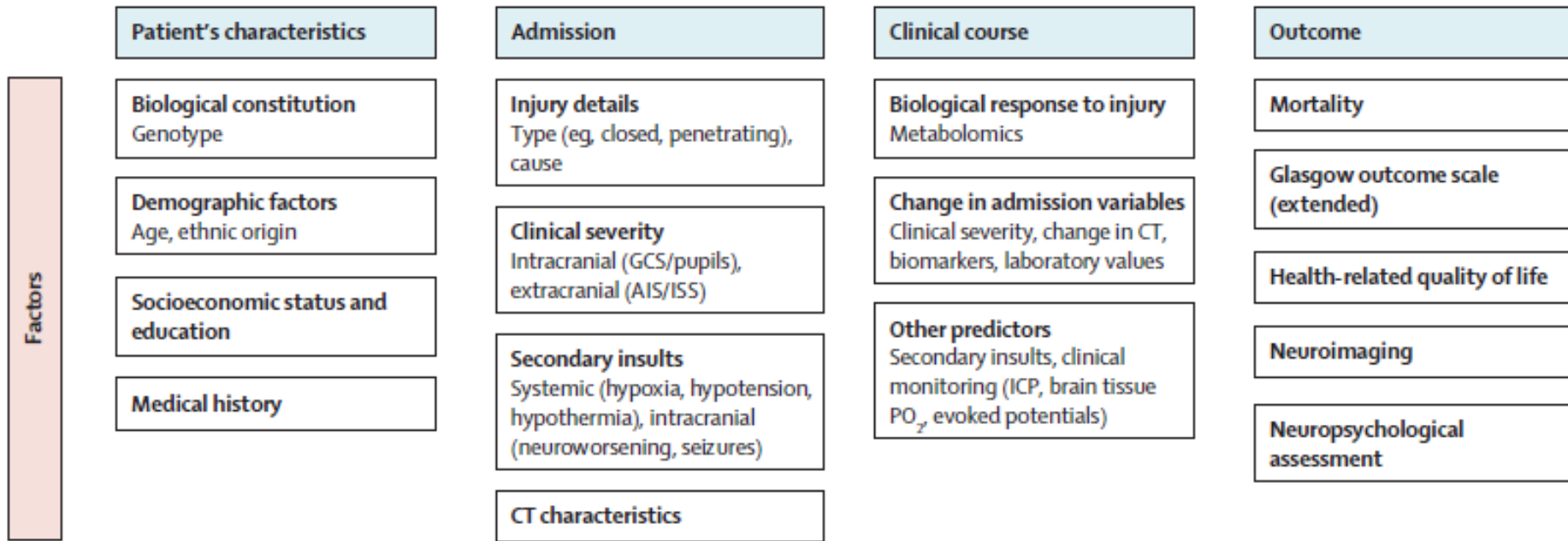


Figure 1: Overview of the components of prognosis in traumatic brain injury

GCS=Glasgow coma scale. AIS/ISS=abbreviated injury score/injury severity score. ICP=intracranial pressure. PO₂=partial pressure of oxygen.

The IMPACT data set has lead to the validated IMPACT predictors.

<http://www.tbi-impact.org/>



IMPACT = **I**nternational **M**ission for **P**rognosis and **C**linical Trial design in **T**BI
3 centers:

Erasmus University in Rotterdam, Netherlands

University of Edinburgh, Scotland,

Virginia Commonwealth University Medical College, Richmond, VA

IMPACT: 11 studies total (8 RCT; 3 observational cohort studies) n=9099



The IMPACT study risk calculator is a free online tool to estimate the 6-month outcome after TBI.

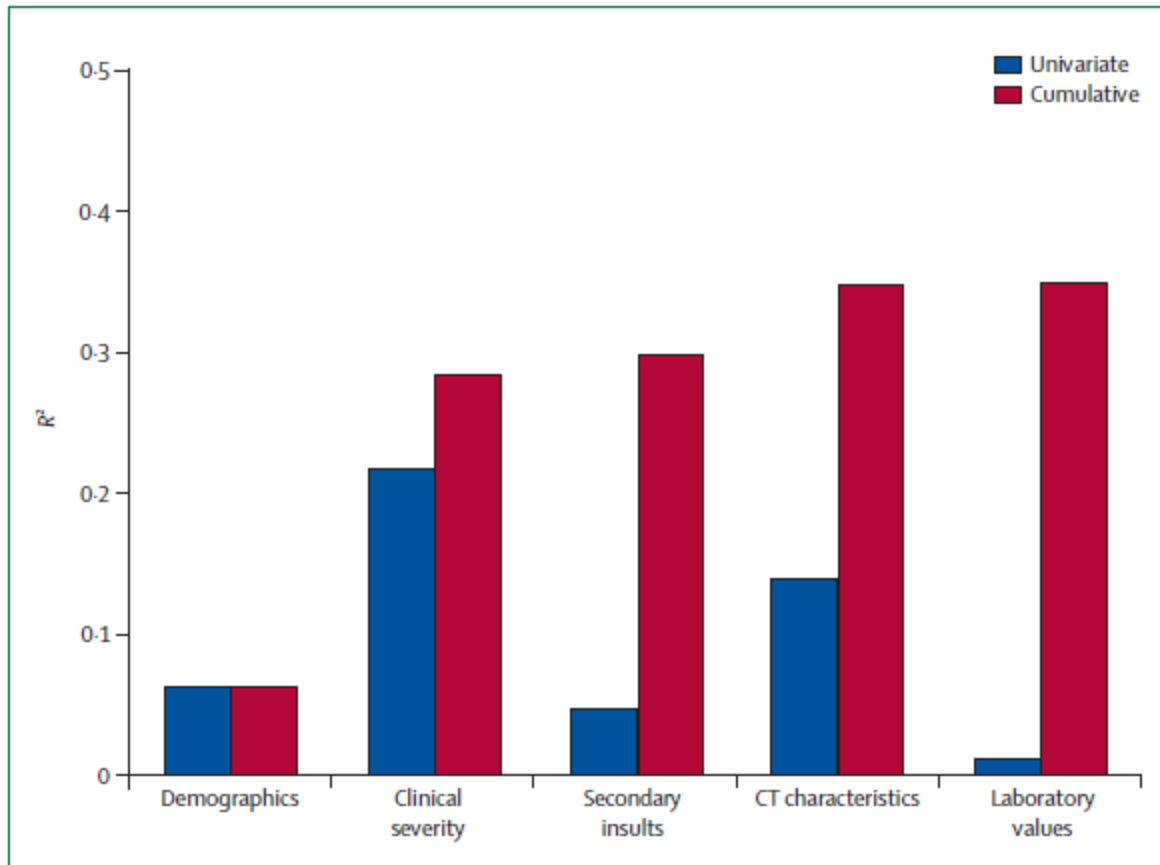
Prediction models for 6 month outcome after TBI

Admission Characteristics	Value
<i>Core</i>	
Age (14-99 years)	<input type="text" value="37"/>
Motor Score	<input type="text" value="Extension"/>
Pupils	<input type="text" value="One"/>
<i>Core+CT</i>	
Hypoxia	<input type="text" value="No"/>
Hypotension	<input type="text" value="Yes"/>
CT Classification	<input type="text" value="Diffuse Injury II"/>
tSAH on CT	<input type="text" value="No"/>
Epidural mass on CT	<input type="text" value="No"/>
<i>Core+CT+Lab</i>	
Glucose (3-20 mmol/L)	<input type="text"/>
Hb (6-17 g/dL)	<input type="text"/>
<input type="button" value="Calculate"/>	<input type="button" value="Reset"/>

From: <http://www.tbi-impact.org>



Admission characteristics are strong prognosticators as shown by the IMPACT data.



The cumulative R^2 of the full model is 0.35.

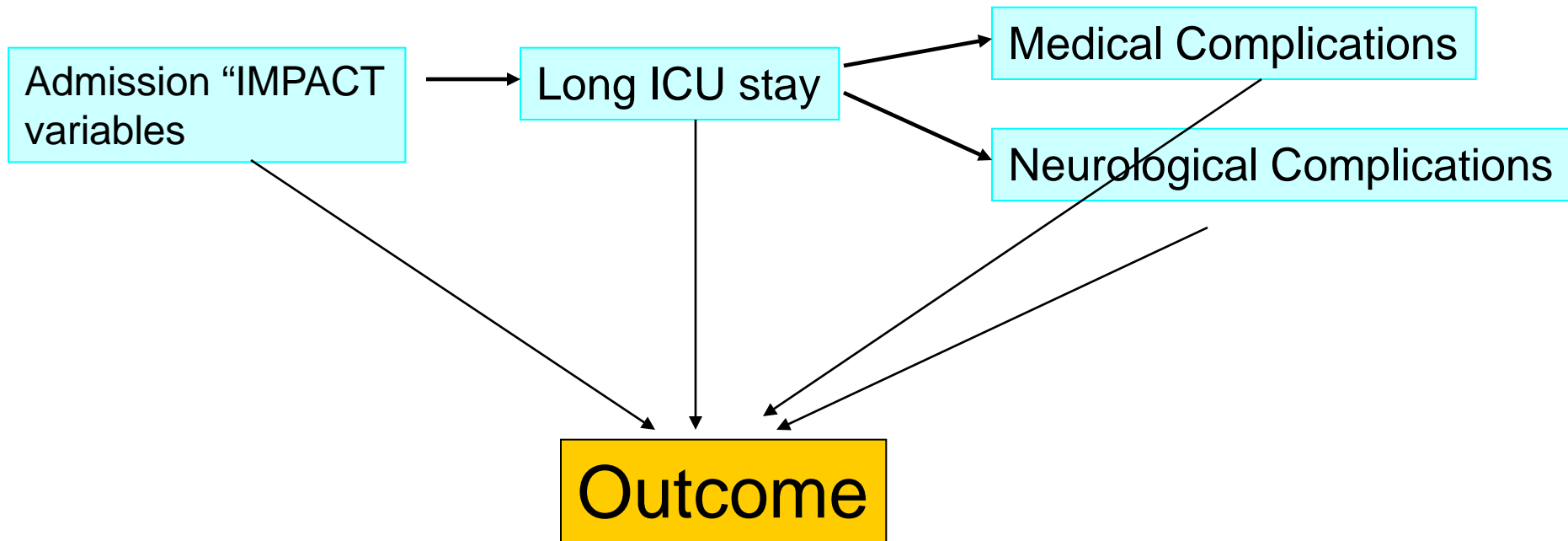
The IMPACT predictors only explain about 1/3 of the outcome variability.

Figure 2: Prognostic value of different components of traumatic brain injury prognosis (R^2) in the IMPACT dataset (n=8686)

The cumulative R^2 of the full model is 0.35. IMPACT=International Mission for Prognosis and Clinical Trial design in TBI. R^2 =proportion of variability in outcome explained by the predictor(s). Data from Murray and colleagues.¹⁰

The IMPACT score ignores the hospital course.

- Our hypothesis:



Prior literature shows that non-neurologic organ failure may contribute to 2/3 of all TBI deaths.

- The number of organs failing correlates with mortality.
- All studies retrospective and largest n=209



UMASS OPTIMISM Study (Outcome Prognostication in Traumatic Brain Injury)

Started Nov 2009, ongoing
Total n=238



limited to moderate-severe TBI
456 datafields

Demographics

Pre-hospital data

Trauma ED data

Head CT data – consensus by all three neurointensivists

ICU admission “enrollment” post-resuscitation GCS first 24h unless intoxicated

NSG interventions

Specific ICU complications, predefined,
reviewed weekly, – consensus by all three neurointensivists

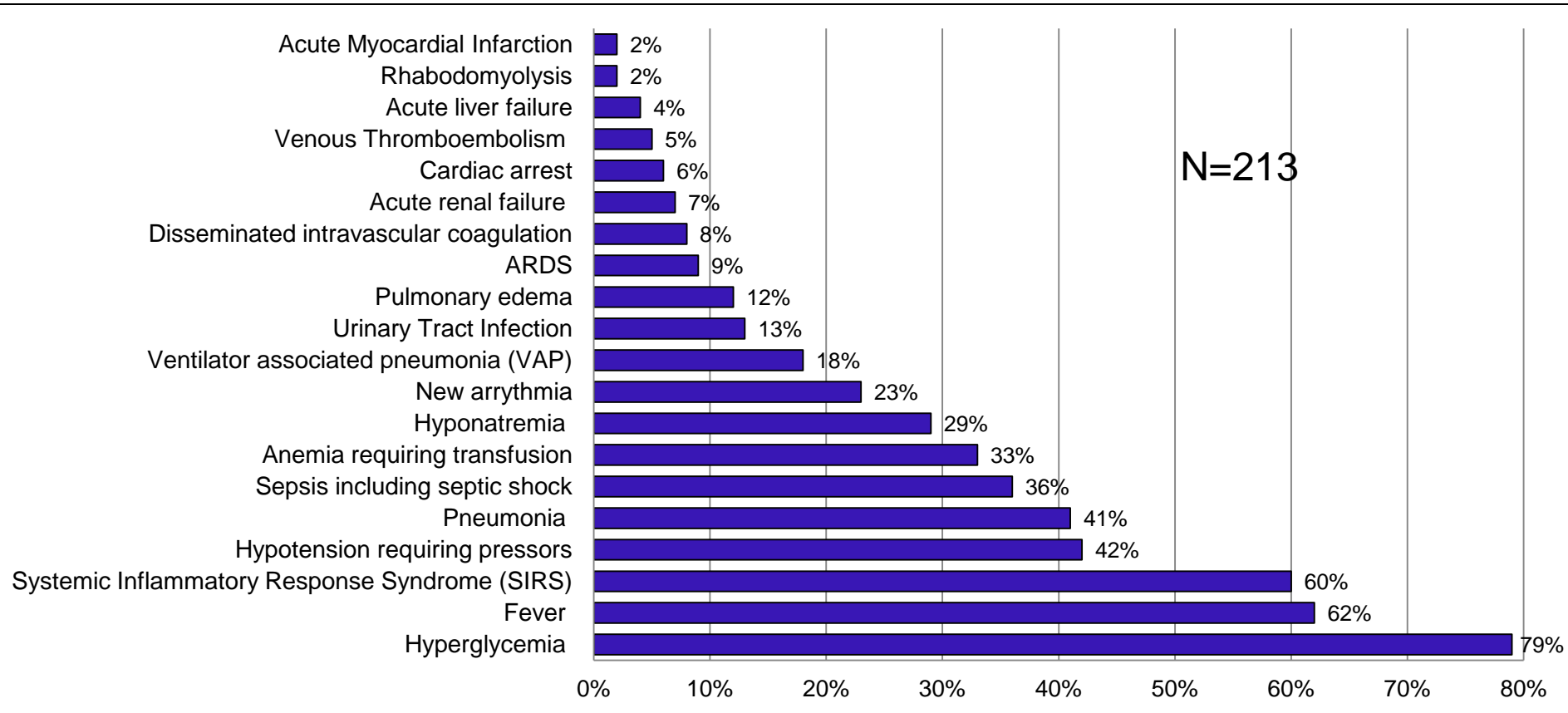
Outcome: GOS at hospital discharge

3-month, 12-month by phone, recently added 6-month:

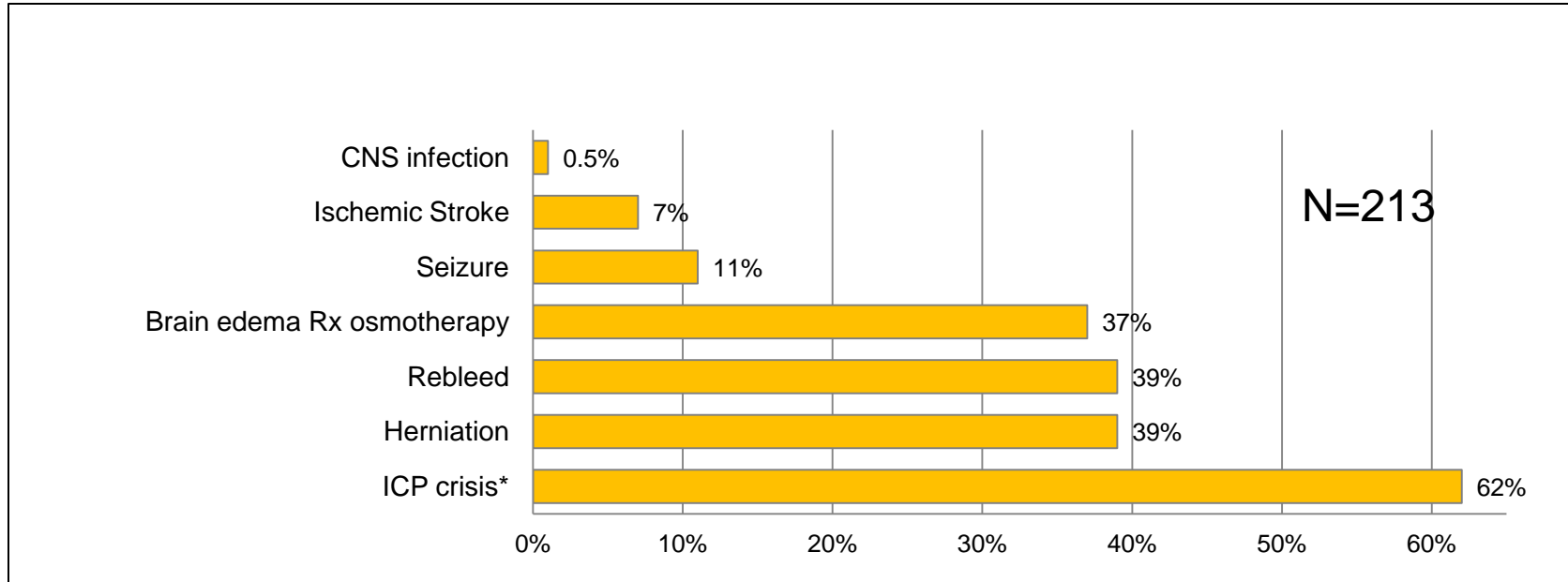
GOS, GOSE, mRS, Lawton ADL, SF-12, TICS



ICU medical complications are common in our cohort:



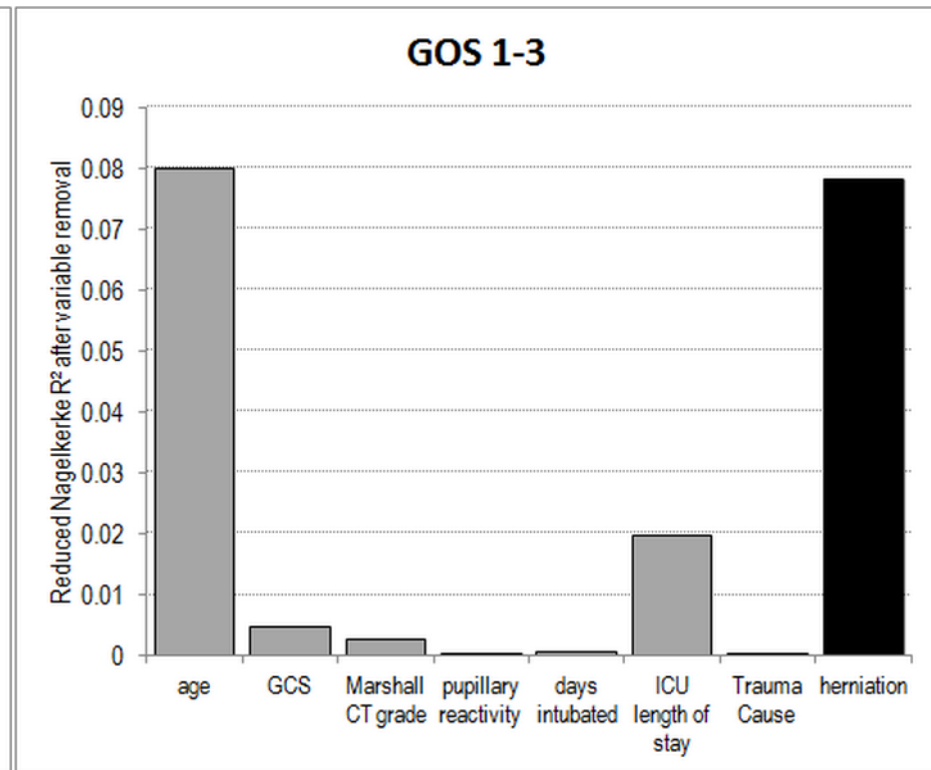
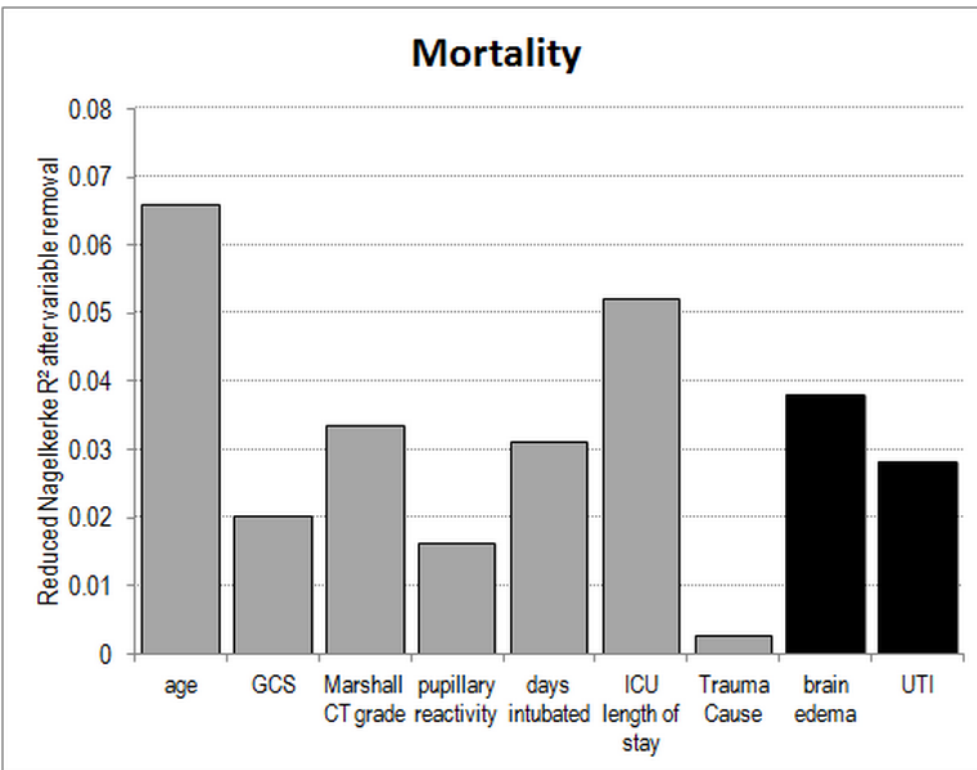
These are the neurological ICU complications in our cohort:



*ICP crisis in n=62 patients with ICP monitor in place

Muehlschlegel et al. Neurocritical Care 2013

ICU complications contribute significantly and to a high degree to the outcome variability.



In summary, outcomes research may identify modifiable predictors of outcome.

- Outcome prognostication is extremely important
- Be aware of self-fulfilling prophecies
- Focus on ICU course to identify factors that may explain the other 2/3 of the variability of outcome after TBI



Thank you...

....Any questions?



"How do you want it—the crystal mumbo-jumbo or statistical probability?"

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