

E.S.P.

Extra-(Operating Room) Sensor Perception

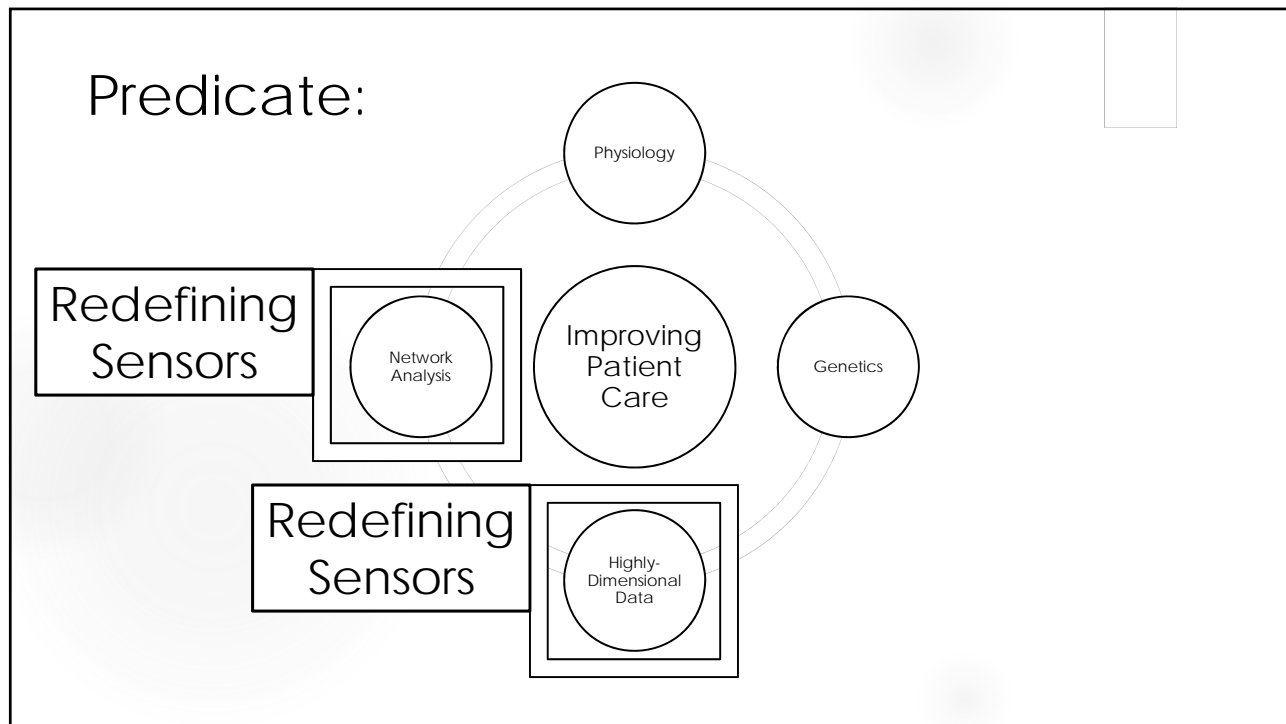
PATRICK TIGHE MD MS

UNIVERSITY OF FLORIDA

DEPARTMENT OF ANESTHESIOLOGY

Disclosures

- ▶ No Conflicts of Interest
- ▶ This work is supported by the NIH NIGMS K23 GM102697
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 - ▶ Haldun Aytug PhD
 - ▶ Roger Fillingim PhD



OBJECTIVES

Can we solve our patients' problems outside the OR?

- ▶ Network Medicine & Extra-OR Challenges
- ▶ Event Prediction: Postoperative Pain
- ▶ Primary Prevention: Postoperative Complications

OBJECTIVES

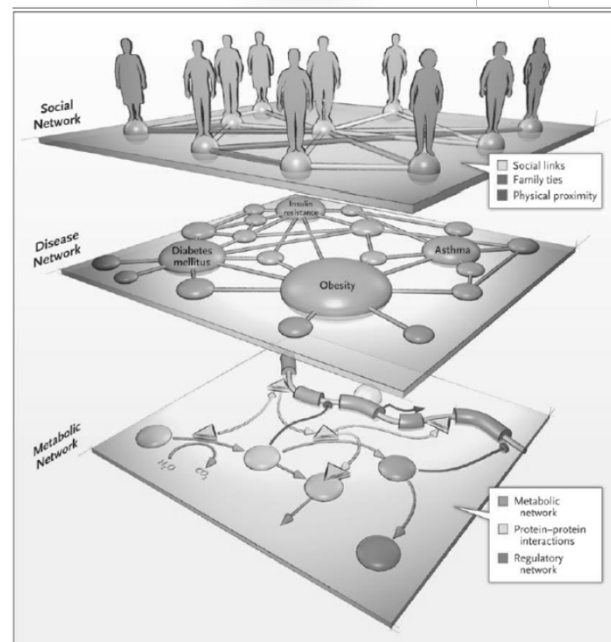
Can we solve our patients' problems outside the OR?

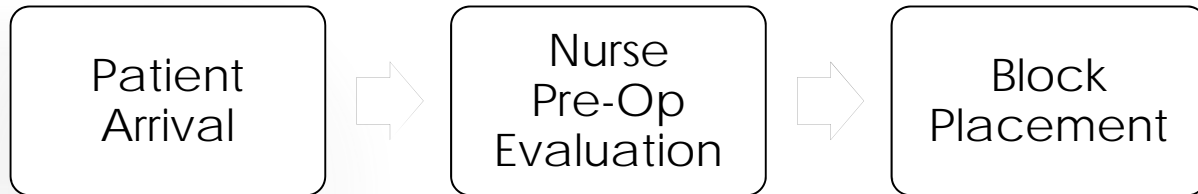
- ▶ Network Medicine & Extra-OR Challenges
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Network Medicine

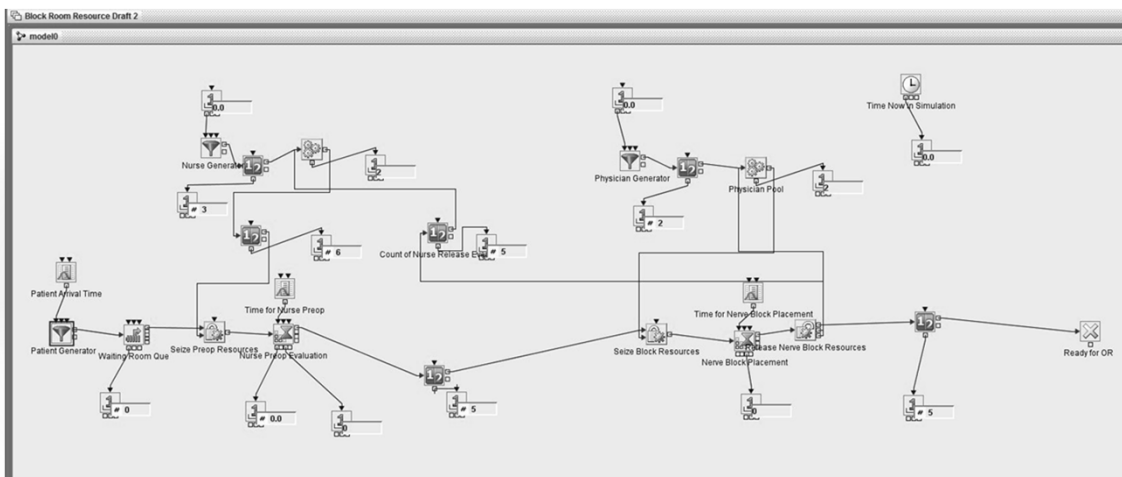
Network Medicine — From Obesity to the “Diseasome”

Albert-László Barabási, Ph.D.

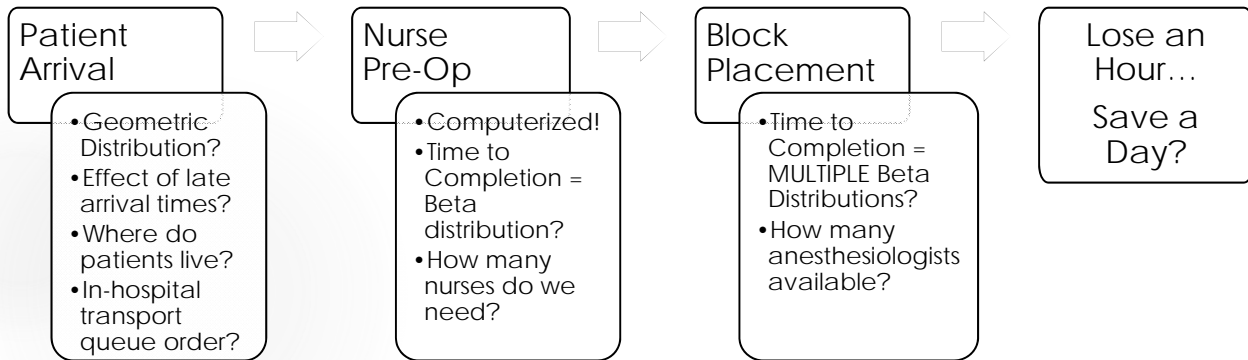




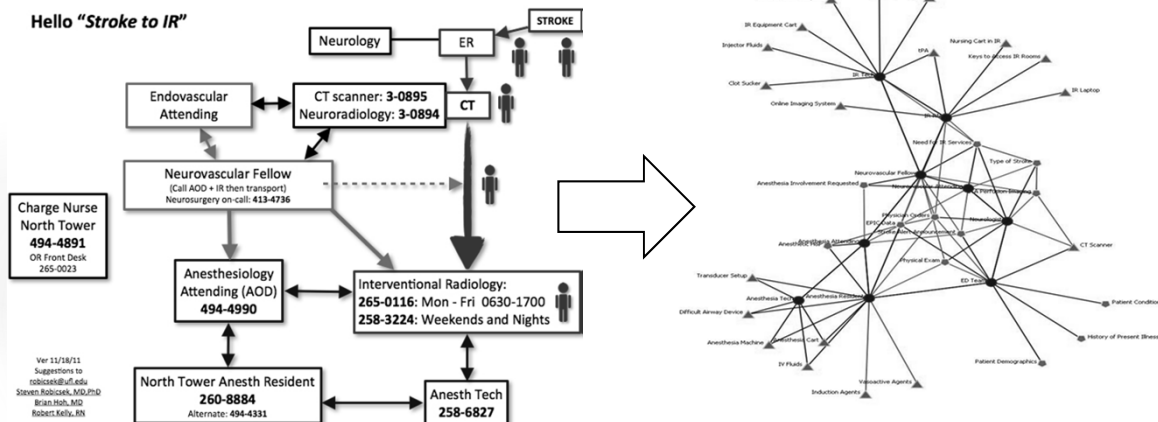
Block Room Discrete Event Modeling



Block Room Discrete Event Modeling



What About Stroke-to-IR?



Stroke: Just How Important are *YOU*?

Rank	Total Degree Centrality			Eigenvector Centrality			Betweenness Centrality		
	Nodes	Score	Context	Nodes	Score	Context	Nodes	Score	Context
1	Neurovascular Fellow	16	3.659	Neurovascular Fellow	0.359	0.585	Neurovascular Fellow	234.001	0.46
2	Anesthesia Resident	16	3.659	Neurologist	0.329	0.432	Anesthesia Resident	188.124	0.318
3	IR RN	13	2.667	EPIC Data	0.29	0.232	Anesthesia Attending	133.108	0.148
4	IR Tech	12	2.336	Neurovascular Attending	0.286	0.212	IR Tech	131.817	0.144
5	ED Team	12	2.336	IR RN	0.26	0.077	ED Team	131.723	0.144
6	Neurologist	12	2.336	Physician Orders	0.255	0.051	EPIC Data	125.166	0.123
7	EPIC Data	12	2.336	ED Team	0.254	0.05	IR RN	118.6	0.103
8	Neurovascular Attending	10	1.674	Anesthesia Resident	0.234	-0.056	Neurologist	102.744	0.054
9	Anesthesia Attending	10	1.674	Need for IR Services	0.228	-0.086	Need for IR Services	51.617	-0.104
10	Anesthesia Resident	7	0.682	CTA Perfusion Imaging	0.216	-0.146	Neurovascular Attending	44.386	-0.126
11	Physician Orders	7	0.682	Stroke Alert Announcement	0.212	-0.167	Physician Orders	24.773	-0.187
12	CTA Perfusion Imaging	7	0.682	Anesthesia Attending	0.209	-0.184	CTA Perfusion Imaging	24.266	-0.189
13	Need for IR Services	7	0.682	Physical Exam	0.173	-0.364	Type of Stroke	19.783	-0.202
14	Type of Stroke	6	0.351	Type of Stroke	0.156	-0.453	Anesthesia Tech	17.321	-0.21
15	Stroke Alert Announcement	5	0.021	IR Tech	0.154	-0.464	CT Scanner	8.3	-0.238
16	Anesthetic H&P	4	-0.31	Anesthesia Involvement Requested	0.148	-0.496	Physical Exam	7.797	-0.239
17	Anesthesia Involvement Requested	4	-0.31	CT Scanner	0.118	-0.649	Anesthesia Involvement Requested	4.622	-0.249
18	Physical Exam	4	-0.31	Anesthetic H&P	0.108	-0.7	Stroke Alert Announcement	3.85	-0.252
19	CT Scanner	3	-0.641	Anesthesia Tech	0.063	-0.93	Anesthetic H&P	2	-0.257
20	IPA	2	-0.972	IPA	0.061	-0.94			

What about Core OR Teams?

TABLE 3. Core/Periphery Network Results

Variable	General surgery	Neurosurgery
Number of cases	4,356	1,645
Core/periphery correlation coefficient	0.790	0.933
Gini coefficient	0.641	0.767
Composite gini-based core/peripheriness	0.506	0.715
Heterogeneity	0.004	0.009
Mean overall coreness	0.020	0.021

Health Research - November/December 2011 • Vol 38, No 5, 578-585

Characterizing the Structure of Operating Room Staffing Using Social Network Analysis

Christine Anderson • Akshay Patel

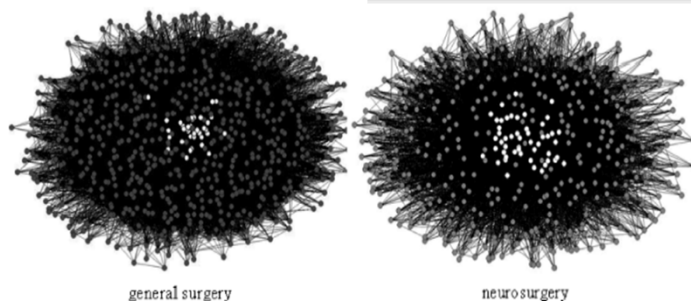


FIGURE 1. Network representation of core/periphery staffing structures. White circles indicate core members.

APM at the University of Florida



Table 1 Network complexity metrics

Measure	Value
Row count	84
Column count	84
Link count	208
Density	0.03
Isolate count	0
Reciprocity	0.425
Characteristic path length	3.095
Clustering coefficient	0.197
Network levels (diameter)	7
Network fragmentation	0
Krackhardt connectedness	1
Krackhardt hierarchy	0.787
Average speed	0.323

ACUTE & PERIOPERATIVE PAIN SECTION
Original Research Articles
Social Network Analysis and Quantification of a
Prototypical Acute Pain Medicine and Regional
Anesthesia Service

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Over 40% of patients suffer from *moderate to severe* postoperative pain!!!

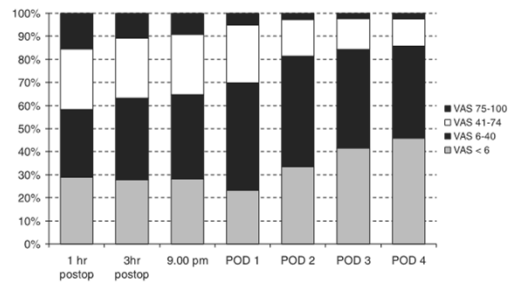


Figure 1.
Distribution of pain at rest (visual analogue scale) on the day of surgery (1 and 3 h postoperatively and at 9.00p.m.) and mean pain on postoperative days (PODs) 1–4.

Original Article

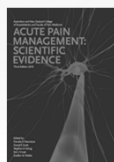
The prevalence of postoperative pain in a sample of 1490 surgical inpatients

M. Kessner¹, J. M. de Rube², W. van Kleef³, A. G. H. Kessner⁴, M. L. P. P. J. W. J. M. Kessner⁵, M. L. P. P. J. W. J. M. Kessner⁶, M. L. P. P. J. W. J. M. Kessner⁷, M. L. P. P. J. W. J. M. Kessner⁸, M. L. P. P. J. W. J. M. Kessner⁹, M. L. P. P. J. W. J. M. Kessner¹⁰

¹Department of Anesthesiology, University of Groningen, Groningen, The Netherlands; ²Department of Anesthesiology, University of Groningen, Groningen, The Netherlands; ³Department of Anesthesiology, University of Groningen, Groningen, The Netherlands; ⁴Department of Anesthesiology, University of Groningen, Groningen, The Netherlands; ⁵Department of Anesthesiology, University of Groningen, Groningen, The Netherlands; ⁶Department of Anesthesiology, University of Groningen, Groningen, The Netherlands; ⁷Department of Anesthesiology, University of Groningen, Groningen, The Netherlands; ⁸Department of Anesthesiology, University of Groningen, Groningen, The Netherlands; ⁹Department of Anesthesiology, University of Groningen, Groningen, The Netherlands; ¹⁰Department of Anesthesiology, University of Groningen, Groningen, The Netherlands

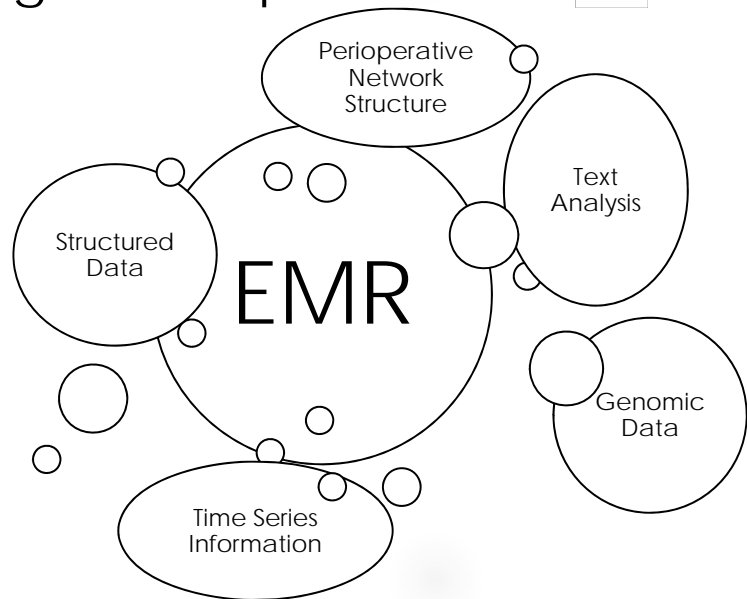
Risk Factors:
Progression to *chronic* pain

**30-70% of
post-surgical
patients!!!**

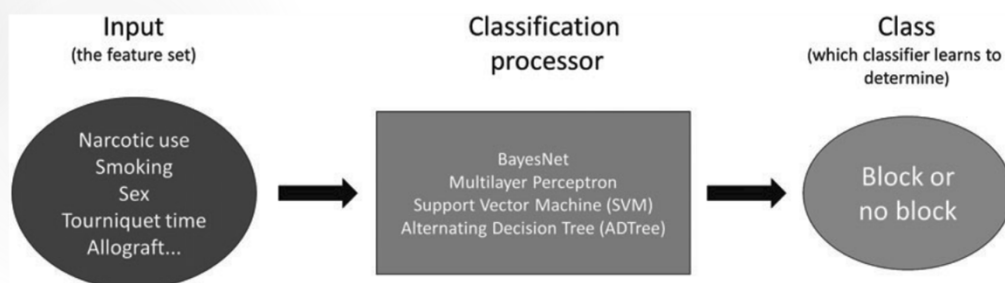
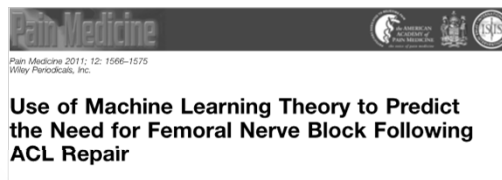


Machine Learning & Perioperative Outcomes

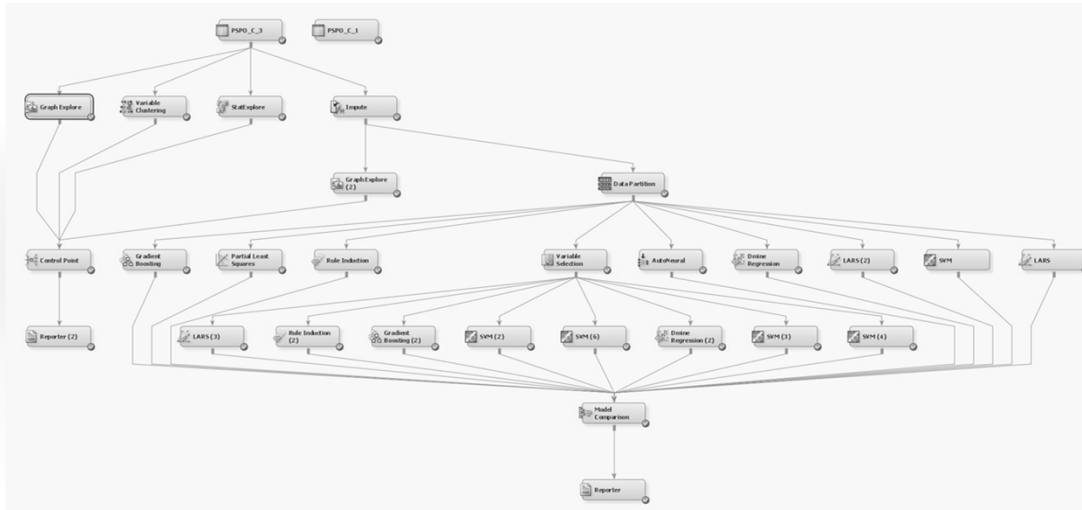
- **Highly-Dimensional Data**
- *Few Patients (n), Many Variables (p)*
- **Curse of Dimensionality**



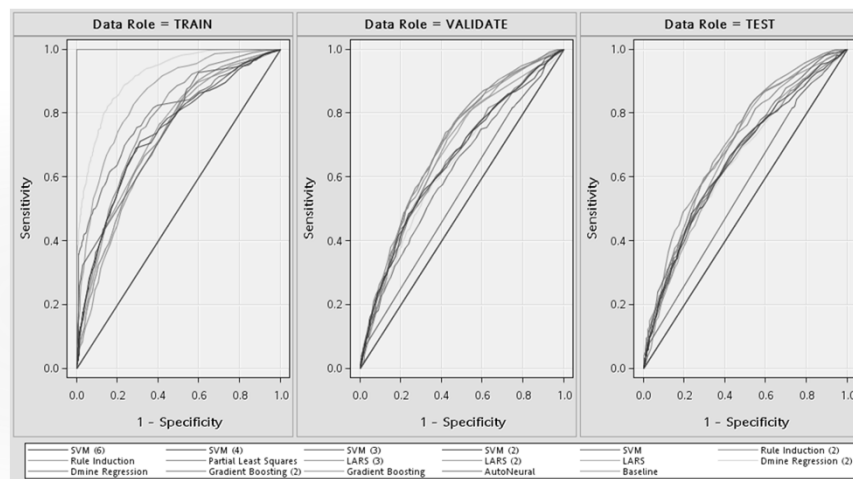
Machine Learning Forecasts Postop Femoral Nerve Block Requirement



Machine Learning Forecasts Postoperative Pain Severity



Machine Learning Forecasts Postoperative Pain Severity



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Quality in Health Care 2001;10(Suppl II):ii21-ii25

ii21

Diagnosing “vulnerable system syndrome”: an essential prerequisite to effective risk management

J T Reason, J Carthey, M R de Leval

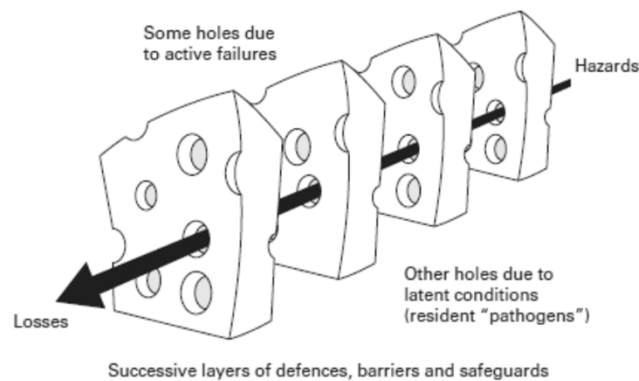


Figure 1 The “Swiss cheese” model of accident causation.

Team situation awareness and the anticipation of patient progress during ICU rounds

Tom W Reader,¹ Rhona Flin,² Kathryn Mearns,² Brian H Cuthbertson³

Table 2 Proportion of patients for which the intensive care unit team formed shared anticipations of patient progression, and the accuracy of anticipations for predicting patient outcomes

Situation awareness item	Percentage of patients for which the team formed shared anticipations	Percentage of anticipations accurate for predicting patient outcomes (by team member)			
		Team member			
		Senior doctor	Senior trainee	Junior trainee	Senior nurse
Discharge likelihood	64	65	77*	61*	66
Deterioration likelihood	45	75*	70	59*	60*
Ventilation likelihood	64	70	67	69	69
Survival likelihood	65	67	65	65	63

N≤105 patients.

*Significantly different at $p < 0.05$.

When you have a question...

BMC Health Services Research

BioMed Central

Research article

Understanding communication networks in the emergency department

Nerida Creswick^{*1}, Johanna I Westbrook¹ and Jeffrey Braithwaite²

Open Access

Do we need to communicate *more...* or *better*?

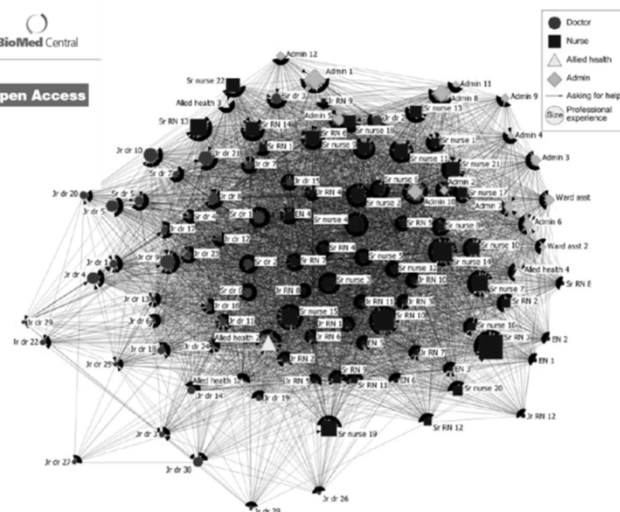


Figure 1 Work-related problem solving network.



Thank you!

PTIGHE@ANEST.UFL.EDU