




Clinical networks – Making healthcare safer by exploiting their natural properties

Jeffrey Braithwaite, William B Runciman, Alan Merry

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Research team

- Professor Jeffrey Braithwaite
Foundation Professor and Director, Australian Institute of Health Innovation, University of New South Wales, Sydney, Australia
- Professor Bill Runciman
Professor, Patient Safety & Healthcare Human Factors, School of Psychology, Social Work & Social Policy, University of South Australia
- Professor Alan Merry
Professor of Anaesthesiology, University of Auckland, New Zealand, Chair of the Quality and Safety Committee, World Federation of Societies of Anaesthetists





PART A: a problem and proposal

Problem: we have thrown a lot at patient safety

- Training
- Reorganisation
- Policy
- Data
- Guidelines
- Accreditation
- Regulation
- Root cause analysis
- New posts
- Information management
- [Insert your own favourite strategy here]





But with mixed success

- Overall, such measures have proven inadequate
- We propose we need to harness:

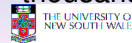


the natural properties of the complex sociotechnical health system [Braithwaite, Runciman and Merry, 2009]








Why?

- Conventional top down interventions result in only modest improvements
- Patient safety is a wicked problem – one that is messy, persistent and multi-dimensional
- Politicians, bureaucrats seek to shape clinical practice by edict
- But clinical practice is actually shaped by the behaviours, attitudes of thousands of practicing clinicians








PART B: natural properties of complex systems

Many complex systems have similar natural properties and behaviours

- Common network features have been identified by researchers in fields as diverse as mathematics, sociology, marketing science, psychology
- We need to harness these features to create spread and sustainable change

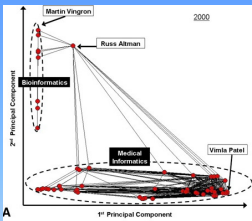






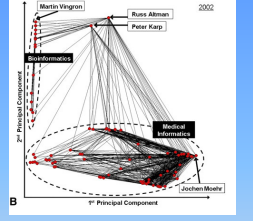
Boards of Directors in business

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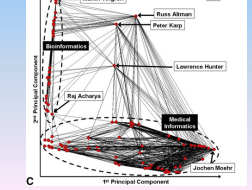


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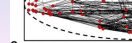


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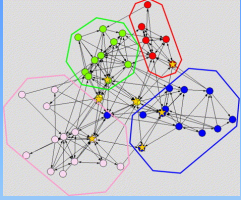
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First two principal components of the editorial adjacency graph for the years (A) 2000, (B) 2002, and (C) 2005. Nodes correspond to members, and lines correspond to existing edges in the editorial adjacency graph. These represent the editorial boards of journals in medical informatics and bioinformatics



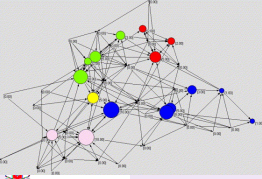
[Malin and Carely, 2007]





Network map of the Forensic Science Laboratory, Ireland, recording advice given from scientist to scientist over a 3-day period where forensic scientists have formed four CoPs. Biology (green), Chemistry (blue), DNA (red), Drugs (pink), Executive management (yellow). Management (gold stars).

Doak, S. and D. Assimakopoulos (2007). "How do forensic scientists learn to become competent in casework reporting in practice: A theoretical and empirical approach." *Forensic Science International*, 167D-3: 201-206.



Prestige of scientists proportional to diameter of vertices—sixteen scientists within a laboratory network give advice.

linGov

Natural properties of complex systems

Properties of complex systems	Health care manifestations
Natural networks	Groups of clinicians who interact professionally to share information, support, consult, refer, and jointly manage patients
Natural hubs and scale-free behaviour	Opinion leaders in networks who disproportionately influence policies, events or practices
Natural pathways, connectivity and small-worlds	Communication channels facilitating the rapid dissemination of information via "grapevines" and communities of practice.
Natural appeal and stickiness	Messages and communications that are convincing, and are absorbed amongst clinical cohorts
Natural propagation and tipping points	The point at which a message, idea or practice whose time has come is readily adopted by a critical mass of clinicians
Natural categories and natural mapping	The identification of clinically relevant problems grouped as accessible data, to facilitate decision-making and solutions to health care problems
Natural interest and self-selection	Clinicians with common concerns and complementary expertise voluntarily grouped together to collectively resolve coal-face clinical problems

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PART C: articulating these natural properties

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Two types of networks

- Type A: purpose-designed, funded or imposed by authority, in structured organisational or institutional forms [designed, mandated networks]
- Type B: those composed of the relationships amongst clinicians, via professional interests, referrals, supports, friendships, communications and advice [natural networks]


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Natural networks

- Natural networks do not respond well to conventional management or control measures
- They emerge spontaneously and propagate or function with little or no externally imposed structure or resources
- They can exert powerful and pervasive influences on how systems function

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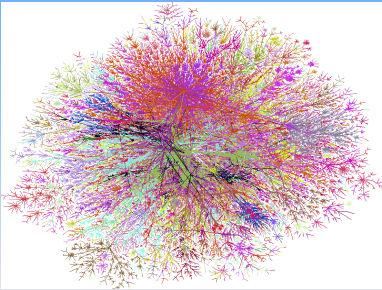
Example A: friendship clusters in a school






[Moody, 2001]

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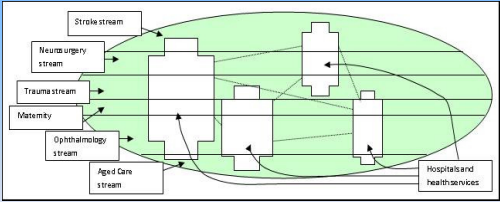
Example B: the internet






[Cheswick, 2007]

Example C: clinicians networked in GMT²



[Braithwaite and Goulston, 2004]

Example D: obesity ties in the Framingham Heart Study

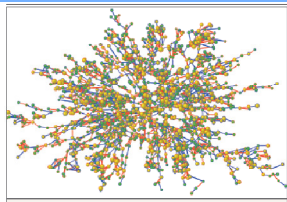








Figure 1. Largest Connected Subnetwork of the Social Network in the Framingham Heart Study in the Year 2000. Each node (individual) represents one person with a 2000 BMI of 25.0 or greater. Other subnetworks of the social network consist of all friends, family, or other contacts with high network centrality. The size of each circle is proportional to the person's body mass index. The inner nodes of the network indicate persons who are either obese or have partners, but are not obese, and are given priority in network position. The size of the links between the nodes is related to the frequency of contact. Each person has a maximum of 100 links and a maximum degree of 100.

[Christakis and Fowler, 2007]




Natural hubs and scale-free behaviour

- Nodes [hubs] are not randomly distributed [scalable] but are scale-free
- I.e., they are unequally distributed
- Many nodes are relatively isolated, with one or two links
- Some nodes have a moderate number of links

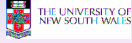


Natural hubs and scale-free behaviour

- Others are the distributed force field of the network, with many links
- These are the:
 - Google search engine
 - King's Cross St Pancras railway station
 - Prominent clinicians at the centre of nests of referral, consultation or collegial patterns

Natural hubs and scale-free behaviour

- Counter-intuitively, scale-free networks resist jamming
- They concentrate effort efficiently
- The hubs are the key to this efficiency

Natural pathways, connectivity and small worlds

- The sociology of networks is that they can be highly efficient
- The term for this is 'small worlds'
- These are fast, navigable routes through the complex montage of connections



Natural pathways, connectivity and small worlds

- The ties between any two of us can be mapped through no more than 'six degrees of separation'
- You do not have to know everyone in a chain across the six degrees – just the next person, who knows someone else, and so on



Natural appeal and stickiness

- Messages in a network have to be remembered, and acted upon
- Stickiness is about how memorable a message is – how it is presented, cognitively processed and encoded
- Sticky messages have natural appeal
- Stickiness is enhanced by novel messages, smooth transition modes, and cues in the environment



Natural appeal and stickiness

- As well as:
 - Using forcing functions to facilitate compliance
 - Using a critical mass of champions or opinion leaders to make the message stick



Natural propagation and tipping points

- A tipping point is the stage when a critical mass for sustained momentum is reached
- It's the juncture when a concept, social movement, or epidemic catches
- It often requires a trigger for a state change, known as 'a phase transition'
- EBM, for example, has not reached this point – yet



Natural categories and natural mapping

- To deal with patient safety, we need to find out what is going wrong, then how and why things are going wrong
- In order to disseminate preventative, and corrective strategies
- These need to be meaningful to clinicians
- Thus we need to categorise data into *clinically meaningful categories*

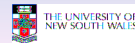


Natural categories and natural mapping

- Runciman's principal natural categories [PNCs] are a case in point
- Natural mapping allows for things to be grouped in a representation reflecting their relationships in the real world
- It allows data to be stored, then abstracted and analysed for future use



PART D: towards a bottom-up solution to patient safety



Putting natural interest and self-selection to work

- For every healthcare problem there are hubs, clusters and sub-clusters made up of clinicians with a special interest and expertise in that area
- Inviting interested parties to engage, review a problem area, and make a plan to address it is a successful strategy – when it works



Putting natural interest and self-selection to work

- Additional network members with interest or motivation can be recruited
- Some will already be integrated in the network with weak or strong ties
- Others will be more distantly related
- This gets together people with natural interest, coalescing around a problem, who are self-selected



Exploring this idea

- Top-down initiatives will happen anyway – they are the obsession of those in authority, and will continue
- *We propose asking expert groups with natural interest in a problem corresponding to a natural category which compromises the safety and quality of healthcare by harnessing the natural properties of networks and clinicians' behaviour*



Exploring this idea

- Examples: Runciman's pulse oximeters in the 1980s, NICE in the UK, Joanna Briggs in Australia more recently
- Initial problems could be those that are widespread, costly and amenable to mitigation by proven interventions of reasonable cost-benefit



Our steps

1. Choose a problem
2. Provide modest funding for 2–3 experts to present at a meeting
3. Publicly involve others, especially hubs and those in networks
4. Exclude no-one
5. Purpose of meetings: develop a tool to address the problem
6. Or develop a plan to develop a tool

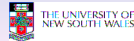


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Why tools not guidelines?

- Guidelines tolerate outdated habits and idiosyncratic practices
- Tools should have a quadruple purpose:
 - Outline what should be done
 - Record that tasks have to be done
 - Facilitate audit
 - Promote dissemination, stickiness and use of the principle



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Why tools not guidelines?

- Solutions developed and tools should incorporate standards, and be endorsed by professional organisations
- And be kept up to date by the network



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Natural surveillance and collegial behaviour

- Compliance with the tools should be audited informally within the network
- Tools should be designed to make compliance easy
- No-compliance should be justified
- Using natural surveillance by the network will be an important feature
- Tools incorporating standards can be subject to more formal audit



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PART E: concluding remarks

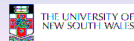


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Conclusion

- The evidence is strong – current approaches to addressing health system problems are inadequate
- Hierarchical approaches have largely failed in the face of entrenched opposing forces of clinical autonomy
- We should harness the natural properties of the sociotechnical system which come naturally to clinicians



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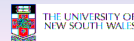
Conclusion

- This promotes effective self-regulation
- Clinicians work best when they are encouraged to flourish in groupings of their own interests and preference
- When they are empowered not directed
- And nurtured and influenced by their peers rather than controlled by others



Conclusion

- They need to be invited not compelled
- And encouraged to solve naturally-occurring problems in voluntary collaborations with fellow clinicians
- We propose encouraging the use of natural properties in complex sociotechnical systems
- And the development and use of mutually constructed tools



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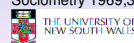
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