

The Cynefin framework: applying an understanding of complexity to medicine

Ben Gray MNChB, MBHL, FRNZCGP (disting)

Primary Health Care & General Practice, University of Otago, Wellington, New Zealand

Medicine is complex. General practice and hospital medicine approach complexity differently. Hospitals cut medicine into specialist parts, each knowing a lot about their speciality. General practice developed different skills and abilities based on whole patients. Complexity theory implies that these approaches are complementary. The Cynefin framework¹ (see Figure 1) was developed by Snowden for business problems but applies well to medicine.

Obvious

A healthy child's forearm fracture is an obvious problem. Any doctor could diagnose this based on history, examination and X-ray, and treat with a high expectation of cure. Obvious problems respond to protocols, such as nurses dispensing medications, checking expiry dates, patient identities, medication, dose and time. Analysis or experimenting is not helpful.

Complicated

Complicated problems such as managing acute myocardial infarction have a clear diagnosis with effective treatment, but require analysis and sometimes specialist knowledge. With expert knowledge and analytical tools, outcomes are better than if care is left to generalists without analytical tools.

Specialists often work in the complicated domain. Investigation, analysis and specialised knowledge can find good solutions. This is the domain of medicine's great successes; for example, treatment of infections, trauma management and cataract replacement.

Complex

Diabetes management is complex.² Diabetes management guidelines cannot ensure optimum outcomes for all diabetes patients. Patients vary

with exercise, remembering medication, focus on diabetes management, and health literacy. Many people with diabetes do not achieve control of their condition but better control is approached by probing, identifying possible changes, trying them and evaluating the outcome. If there is insufficient improvement then something else needs to be tried. Imposing 'best practice' and blaming patients as 'non-compliant' is ineffective. Instead clinicians must '*patiently allow the path forward to reveal itself*'¹ by trial and error.

General practitioners (GPs) often work in the complex domain, operating with uncertainty. They cannot investigate every presenting problem with blood tests and imaging so they probe and experiment. Commonly they try something based on a probable diagnosis³ and review later to see whether the patient improved, or needs more investigation.

Chaotic; Rapid response domain

Car accidents with multiple victims illustrate the chaotic zone. Clinicians act to establish order (triage the dead from the serious, from the minor). If there is heavy bleeding it must be staunch and an IV line established to stabilise the patient and transform the problem from chaotic to complex. Communication is top down: the senior clinician must direct the resources. There is no time for consultation and reaching agreement. Clinicians must act to gain control. See summary in Table 1.

Disorder zone

GPs encounter problems in the disorder zone but we often do not know exactly where problems will fall. After healing, we know the forearm fracture was an obvious problem. If it does not heal a paediatrician might identify rickets as an underlying cause; a complicated problem. If the fracture results from child abuse, healing one fracture may

J PRIM HEALTH CARE
2017;9(4):258–261.
doi:10.1071/HC17002
Published online 20 December 2017

CORRESPONDENCE TO: Ben Gray

Primary Health Care & General Practice, University of Otago, 23a Mein Street, PO Box 7343, Wellington, New Zealand
ben.gray@otago.ac.nz

not prevent the next; a complex problem. If the child is found by police with the fracture caused by a domestic dispute then they need to take the child into protective care; a chaotic problem. Any medical problem may have elements from several domains. An abused child still needs a fractured arm to be managed by protocol while the complex psycho-social issues are managed.

Only in retrospect can diagnosis and treatment be judged correct

An important challenge is that clinicians use skills from their favoured domain at the expense of other skills, and persist with skills from one domain when problems are clearly from another. This is well illustrated by the story of the surgical checklist.⁴

The surgical checklist

The World Health Organisation (WHO) wished to address excess surgical morbidity and mortality in surgery. Using a version of the Cynefin framework,⁴ Gawande found that surgical teams were bad at dealing with the obvious components of surgery, such as giving pre-operative antibiotics, operating on the correct side, removing abdominal instruments, and cross matching blood. There were also issues of communication, essential for complicated problems needing cross discipline input, and complex problems needing brainstorming. WHO instituted three surgery checklists that addressed these obvious problems and improved team communication. The checklist was trialled in diverse hospitals and led to dramatic improvements; decreased mortality rates (1.5%–0.8%), complications (11%–6%) and surgical site infections (6.2%–3.4%).⁵ Surgical teams usually operate in the complex domain rather than the obvious domain and inconsistently followed protocols for the obvious elements of their task (amputating the wrong leg is always bad). Despite these results, implementing the checklist universally has proven difficult.⁶ Possibly some surgeons are most comfortable operating in the chaotic and complex zones and are not tolerant of protocols (obvious problem) and sometimes not good at communicating and consulting with other team members (complicated or complex problem).

Fig. 1 Categories of medical complexity. Image accessed from and permission for use of image granted by Dave Snowden of Cognitive Edge



Three general practice issues are elucidated by applying the Cynefin Framework.

1. Evidence based medicine and best practice guidelines

Snowden¹ notes that *best* practice is applicable only to obvious problems, *good* practice to complicated problems and *emergent* practice to complex problems. If the gold standard of medical evidence is the randomised controlled trial⁷ then 'best evidence' is in the complicated zone; the result of analysis to find good practice. If best practice clinical guidelines were appropriately named they would reflect the surgical checklist, where the level of supporting evidence is very high. However, several evaluations of guidelines for long-term conditions have shown that only 6–16% of guidelines are based on level A evidence.^{8–10} Guidelines do not address patient beliefs and values.¹¹ An implicit assumption is that all patients share the values of people writing the guidelines. If patients do not share those values then problems become complex: so the *best* management of diabetes patients emerges from conversations with patients that combine patients' values and goals with evidence. For complex problems we need summaries of evidence of the

Table 1. Summary of the Cynefin framework

Type of problem	Predictability	Cause and effect?	Type of practice	Strategy
Obvious	Stable and predictable by all	Clear cause and effect	One right answer Best Practice Protocols essential	Sense Categorise Respond
Complicated	Stable and predictable by experts	Cause and effect discernible with analysis	Several right answers Good Practice Protocols helpful	Sense Analyse Respond
Complex	In flux and unpredictable	Cause and effect may be there but only understood in retrospect	No right answers Emergent practice Protocol unlikely to work	Probe Sense Respond
Chaotic	Turbulent	Situation too turbulent and changing to consider cause and effect	No time to search for answer Act to gain control Protocol no help	Act Sense Respond

relative benefits and harms of treatments, for discussions to develop agreed management plans.¹²

2. Over- and under-diagnosis

Specialists' preferred domain is the complicated domain, relying on analysis and expertise. However, when patients present GPs cannot know which problems will benefit from further analysis (complicated) and which are best managed by trial and error (complex). Irritable bowel syndrome is a complex problem with no obvious treatment. On first presentation with diarrhoea and abdominal pain, investigation to eliminate treatable problems is wise. The more normal the results, the less likely that a treatable cause will be found. Management should then move to trial and error, addressing diet, stressors, and medication for symptoms, while monitoring for signs that need investigation. The risk is that if clinicians manage all problems as complicated problems they will perform more investigations, leading to more false positives, or making diagnoses unrelated to patients' symptoms, but that seem to require management. Working from the inappropriate domain contributes to 'over diagnosis resulting from use of increasingly sensitive tests in those with symptoms and over diagnosis made incidentally - incidentalomas'.¹³(page 1)

The opposite problem is where presentations are managed as complex when there is a diagnosis and specific treatment. GPs risk failing to diagnose treatable problems if they investigate insufficiently. An analysis of complaints about

GPs' delayed cancer diagnoses¹⁴ concluded that they did not investigate early enough. One important skill of medicine is to judge when to manage a problem in the complicated domain, and when in the complex domain. With too much analysis, we get over-diagnosis and resource waste; with too little, treatable diagnoses are missed.

3. Practice targets

The surgical checklist prioritises team attention to task elements with a high level of evidence; a tiny part of a team's work. There is no mention of surgical or anaesthetic technique. After checklist completion, attention is prioritised according to clinical judgement. In general practice, targets have the same effect as a checklist. When seeing patients there is considerable pressure to ensure that targets are addressed, irrespective of reason for attendance.

Controlling infectious diseases is a complex problem. Immunising all children is an obvious element of the overall problem and a good example of a target that is appropriately addressed via protocol (every child should be immunised). The evidence of benefit for immunisation is high. Only by introducing a mandatory target (protocol) have we raised immunisation rates. To achieve the target practices developed systems: eg recall lists, talking with family members of people not immunised, home visiting. It is worth doing and worth the extra funding needed to support it.

Table 2. Strategy for using the Cynefin framework to address a problem

- Considering whether a problem is obvious, complicated, complex or chaotic enables the clinician to choose an appropriate approach to addressing the problem.
- Each domain is best managed by a particular style of thinking. Medicine traditionally treats many problems as complicated, requiring analysis.
- Many of the most intractable problems we face are complex; evidence is helpful but not determinative, and the best approach is to probe to find an emergent solution, by negotiating an agreed management plan with the patient, and reviewing and adapting over time.

Cardiovascular Risk Assessment is different. This process also addresses a complex problem (how to decrease cardiovascular morbidity and mortality in New Zealand) but the evidence supporting this intervention to achieve the overall goal is poor. Krogsbøll's meta-analysis of this topic concludes that '*General health checks did not reduce morbidity or mortality, neither overall nor for cardiovascular or cancer causes*'.¹⁵ The programme evaluation reported no evidence of improved health outcomes but '*striving to achieve the coverage goals did disrupt some other services*'.^{16(p79)} Cardiovascular Risk Assessment was prioritised over other matters that were of value. Mandatory targets for general practice should be limited to interventions supported by a high level of evidence.

Conclusion

Applying the Cynefin framework to GP work helps understanding (see Table 2). We spend most of our time with complex problems because of our focus on complex individual people, but we must recognise when an investigative approach is best. Diagnostic uncertainty is normal and cannot be eliminated. This analysis gives us a framework to live with that more comfortably. Guidelines are appropriate for obvious and complicated problems. We need to integrate the evidence with patients' values and beliefs, using trial and error to find a way forward for complex problems.

References

1. Snowden DJ, Boone ME. A leader's framework for decision making. *Harv Bus Rev*. 2007;85:68–74.
2. Cooper H. *Riding the diabetes rollercoaster: a new approach for health professionals, patients and carers*. Abingdon: Radcliffe; 2007.
3. Heneghan C, Glasziou P, Thompson M, et al. Diagnostic strategies used in primary care. *BMJ*. 2009;338:b946-b. doi:946.10.1136/bmj.b946
4. Gawande A. *The checklist manifesto: How to get things right*. London, UK: Profile Books; 2010.
5. Haynes AB, Weiser TG, Berry WR, et al. A surgical safety checklist to reduce morbidity and mortality in a global population. *N Engl J Med*. 2009;360:491–9. doi:10.1056/NEJMsa0810119
6. Vogts N, Hannam JA, Merry AF, Mitchell SJ. Compliance and quality in administration of a Surgical Safety Checklist in a tertiary New Zealand hospital. *N Z Med J*. 2011;124:1342.
7. Sackett DL, Rosenberg WM, Gray J, et al. Evidence based medicine: what it is and what it isn't. *BMJ*. 1996;312:71. doi:10.1136/bmj.312.7023.71
8. Lee DH, Vilemeyer O. Analysis of overall level of evidence behind Infectious Diseases Society of America practice guidelines. *Arch Intern Med*. 2011;171:18–22. doi:10.1001/archinternmed.2010.482
9. Shaneyfelt TM, Centor RM. Reassessment of clinical practice guidelines: Go gently into that good night. *JAMA*. 2009;301:868–9. doi:10.1001/jama.2009.225
10. Tricoci P, Allen JM, Kramer JM, et al. Scientific evidence underlying the ACC/AHA clinical practice guidelines. *JAMA*. 2009;301:831–41. doi:10.1001/jama.2009.205
11. McCormack JP, Loewen P. Adding "value" to clinical practice guidelines. *Can Fam Physician*. 2007;53:1326–7.
12. Lehman R, Tejani AM, McCormack J, et al. Ten Commandments for patient-centred treatment. *Br J Gen Pract*. 2015;65:532–3. doi:10.3399/bjgp15X687001
13. Moynihan R, Doust J, Henry D. Preventing overdiagnosis: how to stop harming the healthy. *BMJ*. 2012;344:e3502. doi:10.1136/bmj.e3502
14. The Health and Disability Commissioner. *Delayed Diagnosis of Cancer in Primary Care: Complaints to the Health and Disability Commissioner: 2004–2013*. Auckland New Zealand: Health and Disability Commissioner; 2015.
15. Krogsbøll LT, Jørgensen KJ, Grønhoj Larsen C, Gotzsche PC. General health checks in adults for reducing morbidity and mortality from disease: Cochrane systematic review and meta-analysis. *BMJ*. 2012;345:e7191. doi:10.1136/bmj.e7191
16. Allen and Clarke. *More Heart and Diabetes Checks*. Wellington, New Zealand: Ministry of Health 2016.

CONFLICTS OF INTEREST

I have no conflicts of interest to declare.