Practising alchemy: the transmutation of evidence into best health care

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Alchemy was the synthesis or transmutation of all elements in perfect balance to obtain the philosopher’s stone, the key to health. Just as alchemists sought this, so health practitioners always seek the best possible practice for optimal health outcomes for our patients. Best practice requires full knowledge—a little information can be dangerous. We need to serve our apprenticeship before we master our profession. Our profession is about improving health care. While the journey may start at medical school, the learning never ceases. It is not only about practising medicine, it is about the development of the practitioner. Professional practice requires systematic thinking combined with capacity to deal morally and creatively in areas of complexity and uncertainty appropriate to a specific context. It requires exemplary communication skills to interact with patients to facilitate collaborative decision making resulting in best practice. The synthesis of scientific and contextual evidence is a concept which applies to all disciplines where theoretical knowledge needs to be transferred to action to inform best practice. Decisions need to be made which take into account a complex array of factors, such as social and legal issues and resource constraints. Therefore, journey towards best practice involves transmutation of these three elements: scientific knowledge, the context in which it is applied and phronesis, the practical wisdom of the practitioner. All science has its limitations and we can never know all possible contextual information. Hence, like the philosopher’s stone, best practice is a goal to which we aspire but never quite attain.

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Introduction

Alchemy was the synthesis or transmutation of all elements in perfect balance to obtain the philosopher’s stone. It was about the creation of a ‘panacea’, the elixir of life, a remedy to cure all diseases, the key to health. Just as alchemists sought this, so health practitioners always seek the best possible practice for optimal health outcomes for our patients.

Best practice requires full knowledge—a little information can be dangerous. We need to serve our apprenticeship before we master our profession. Our profession is about improving health care. While the journey may start at medical school, the learning never ceases. It is not only about practising medicine—but also about the development of the practitioner.

Professional practice requires systematic thinking combined with capacity to deal morally and creatively in areas of complexity and uncertainty appropriate to a specific context. It requires exemplary communication skills to interact with patients to facilitate collaborative decision making resulting in best practice. The synthesis of scientific and contextual evidence is a concept which applies to all disciplines where theoretical knowledge needs to be transferred to action to inform best practice. Decisions need to be made which take into account a complex array of factors, such as social and legal issues and resource constraints. Therefore, journey towards best practice involves transmutation of these three elements: scientific knowledge, the context in which it is applied and phronesis, the practical wisdom of the practitioner.

Clinical practice can be considered to be the sum of scholarship and professionalism. Scholarship is about empirical knowledge, research evidence, science and logic. We need to know how to assess the quality of evidence, judge the relevance and value of new knowledge to our own practice and determine whether this new knowledge is practice confirming or practice changing. Thus, the basis of our practice is scientific scholarship but we also need to learn the art. Professionalism is about the understanding
and application of contextual knowledge and professional expertise, it is about artistry and judgement. We need both clinical reasoning and ethical decision making.

Alchemy was about integration across domains. The basic elements of water, fire, air and earth and core processes of decomposition, sublimation, distillation, amalgamation, fermentation and purification needed to be precisely combined and balanced to attain the philosopher’s stone. Similarly, clinical practice involves the domains of both scholarship and professionalism. For best practice, we must consider the prevalence of a condition, its diagnosis and treatment and its likely prognosis. However, in our management of patients, we must also consider the interplay of many other factors—the law, human rights and dignity, issues of equity for all patients, the potential benefits and harms of intervening or not intervening, the role of the professional and the emotional responses of all involved (Fig. 1).

Alchemy involves finding perfect combination of planetary metals (such as silver, copper and mercury) and mundane elements (such as potassium and sulphur) to transmute matter into the elixir of life. The alchemist studied and practised for many years striving to reach this goal. In the same way, to determine best practice, we need to know the scientific evidence. Randomized controlled trials can demonstrate whether intervention is effective. This knowledge may be strengthened if we combine trials in systematic reviews and meta-analyse. We need to know how well a test will pick or miss a diagnosis. Case-controlled studies help us identify factors, which contribute to a particular disease. Qualitative research brings narrative to our numbers, adds the why and how to our results (Fig. 2).

However, in practice, evidence needs to be assessed from perspective of a particular patient. Many things contribute to what decisions are actually made. These include both the patient and the practitioner’s values, numerous attributes of the patient (such as their age and their co-morbidities), their family and the community in which they live, their culture and local policy. Limited resources may mean that the ideal test or treatment is not affordable. For example, evidence indicates that heart failure should be diagnosed on basis of an echocardiogram, but if patient does not have access to this test, then the clinician may rely on symptoms and signs. Best management might include use of beta blockers, but if the patient has asthma, which this drug exacerbates, alternative treatments must be chosen. A child with bacterial pneumonia requires

![Figure 1](image1.png)

**Figure 1** Domains of alchemy and domains of clinical practice

![Figure 2](image2.png)

**Figure 2** Types of matter and types of evidence
antibiotics, but relatives of elderly demented and chronically ill person with this condition may decline such treatment for their family member.

Best practice is the transmutation or synthesis of knowledge. However, all science has its limitations. What has been found to be true for particular population may not be generalizable to another. Furthermore, we can never know all possible contextual information. For example, we may not be able to predict that a person will have allergic reaction to drug we give them. Hence, like the philosopher’s stone, best practice is a goal to which we aspire but never quite attain.

Scientific knowledge is incomplete. It is always undergoing change and being added to. We need skills to access and critically appraise new knowledge as research progresses. Likewise, the context changes with every patient, and patient’s needs and values change over time. Professional expertise also requires self-reflection and evaluation of the outcomes of our decisions. All this evidence goes back into the mix and contributes to future decision making (Fig. 3). This is the process of lifelong learning—how the apprentice achieves mastery.

The principle of the synthesis of scientific and contextual knowledge, funnelled through the wisdom of the practitioner, applies to health care in the realms of clinical and forensic practice, research, education and dissemination of information.

Clinical practice

Cecil Lewis, the founding Dean of my Medical School, emphasized that most health care takes place in the community not in the hospital and that doctors should treat patients holistically—body, mind and spirit. He believed it important for doctors to be well-rounded people and their education should include both science and humanity. He introduced a 3-month elective in the final year for students to spend 3 months doing whatever they passionate about, something to feed their soul, be it music, art, science or medicine. Combining theoretical knowledge with real life situations begins with clinical practice.

Alchemists were early doctors, in search of potions to promote healing. This is an intent that doctors still seek, applying scientific knowledge within a particular context to assist our patients to heal. My first general practice experience job was as a locum in Blaengwynfi, a mining village in South Wales. I shared the on-call roster with Dr Julian Tudor-Hart, a GP from the neighbouring village Glyncorrwg. I found him to be a truly inspirational GP. Julian was working with his patients to make their lives healthier through systematically checking their blood pressures and helping them to change their lifestyles—getting them to look at their diet, their smoking and exercise or lack of it. These Welsh villages very impoverished and the GPs who worked there did twice as much work for half pay of those working in more affluent areas. Julian taught me that the people most likely to need health care were the least likely to receive it. It was only many years later that I learned that Julian is an icon of general practice in the UK and that his ‘inverse care law’ is famous.

I worked as a doctor in Jamaica for 2 years, where the health need was great. There I experienced first-hand how best practice has to be tempered by the circumstances and what is available. I ran a health centre just out of Kingston where there had been no doctor for a number of years and ~20 000 people in the catchment area. However, there was a great team of auxiliary staff whom I trained to deliver health talks to the large group of people who would sit in shade of the mango trees waiting to see the doctor. The staff would also write labels, count pills and put into bottles the drugs I used to wheedle from the Ministry depot in downtown Kingston. After every 20 patients, I would stop consulting and dispense my own prescriptions. Patients were instructed to bring back pill bottles for recycling. I used to estimate patients’ haemoglobin levels by the strength of copper sulphate solution in which a drop of their blood would float. While a public laboratory was available at the downtown hospital, generally this was not an accessible option due to resource constraints (most patients could not afford the bus fare) and the potential associated harms (gun wars in ghettos made travelling there dangerous).

Forensic practice

Transmutation of scientific and contextual knowledge also applies to forensic practice. This involves
examining all available evidence about the circumstances, applying what we know from scientific literature and then assessing whether the evidence may confirm or refute that alleged events occurred or were committed by person accused. Both the presence and the absence of evidence need to be considered. Sometimes evidence points to guilt. The accused may then plead guilty or be found guilty at trial. Sometimes evidence points to innocence. The charges may then be dropped or the accused found not guilty. Other times, it provides an estimate of probability or improbability. Crimes do not have to be proved; only that person is guilty beyond reasonable doubt.

The roles of the clinical and forensic practitioner are different, and you cannot serve Hippocrates and Hammurabi at the same time. The clinician serves Hippocrates, the Healer. This role is to relieve suffering, provide treatment and prevent further illness or injury and the duty of care is to the patient. The forensic physician serves Hammurabi, the lawgiver. Here, the role is one of evidence gathering with the basic tenet of impartiality. The role is to provide expert opinion and the duty of care is to the Court. While both roles require the synthesis of scientific and contextual evidence, clinicians called upon as expert witnesses need to make this distinction between their therapeutic and forensic responsibilities. Before a hearing, there is a complainant not a victim and a defendant not an offender. Both clinical and forensic practitioners should treat complainants with compassion and respect, and this treatment should also be afforded to the accused.

Research

The alchemist was researcher, constantly experimenting to find philosopher’s stone. He was looking for the perfect balance not only of ingredients but also of processes. Primary care research needs to study not only the prevalence, diagnosis, management and prognosis of disease but also issues such as how to communicate our knowledge to our patients. Clinical decisions may require the complex weighing up of the potential benefits and harms of each course of action. There are numerous ways to communicate this—as relative or as absolute risk, odds, numbers needed to treat or natural frequencies, positively or negatively framed, as numbers or in pictures.2 Our methods of communication will influence how well our patients understand the possible consequences of a management decision and may also actively encourage or discourage them from making particular choices. Using only relative risk may be manipulative. For example, if we tell a patient that one drug has double the chance of a particular side-effect compared to another, the impact of this information is likely to be very different if the risk changes from 1 in 20 000 to 1 in 10 000. There is no single optimal method of communicating information on potential benefits and harms, but research can assist us to find the best way to impart knowledge to ensure truly collaborative decision making.

Education

Because knowledge is always changing, clinicians need to embark on a journey of lifelong learning and those with knowledge need to pass it on to others. A network of schools of alchemy existed for over millennia, starting in ancient Egypt and Mesopotamia, spreading to India, Persia and the Far East, on through classical Greek and Roman civilizations to the medieval Islamic world and then medieval Europe. The science and art of alchemy were passed down to students by master alchemists.

Postgraduate education needs to follow the same model of combining scholarship and professionalism. In all clinical disciplines, practitioners need the tools to access and critically appraise new knowledge as research progresses to assess the quality of evidence and its relevance to their own practice. This knowledge can then be applied in context of individual patients. Professional expertise also requires self-reflection and the assessment of outcomes of decisions. Postgraduate students need to be able to look at research knowledge from populations and ask:

- Should this confirm or change my practice?
- Are these findings realistic—is this test or intervention available, will it be used and will it be worthwhile?
- Is it relevant to this particular patient?
- How does it apply to patients with other conditions and preferences?
- What are relative gains and risks for my patient?

They can explore their own and other colleagues’ clinical reasoning and decision making in specific scenarios. This enables them to reflect on the weight they give different components, such as exploring and explaining relative benefits and harms of intervening or not intervening and issues relating to the law, equity and human rights and dignity.

Publication

Finally, our ever-growing body of knowledge needs to circulated. The philosophy of alchemy persisted for >2000 years. The findings of alchemists were recorded in texts and scrolls and disseminated in their schools and libraries. The best way to disseminate primary health care knowledge is via our peer-reviewed indexed medical journals. Primarily, this is
the publication of original research. However, while scientific evidence can help inform best practice, sometimes there is no evidence available or applicable for a specific patient with his or her own set of conditions, beliefs, expectations and social circumstances. Evidence needs to be placed in context. General practice is art as well as a science. Quality of care lies also with nature of clinical relationship, with communication and truly informed decision-making. We also need to publish editorials, viewpoints, commentaries and reflections that explore areas of uncertainty, ethics, aspects of care for which there is no one right answer.

Conclusions

In the journey from apprentice to master, we gain knowledge and practical wisdom along way. As clinicians, researchers and teachers, we are all on a journey of lifelong learning, constantly adding and re-evaluating knowledge to practice the best that we can.

Declaration

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References