Estimating the prevalence of drawing in clinical practice among kiwi doctors

Ciléin Kearns a,b,c, Samantha Murton d,e,f, Karen Oldfield a,c, Augustus Anderson a, Allie Eathorne a, Richard Beasley a,c, John Nacey b and Chrystal Jaye g

aMedical Research Institute of New Zealand, Wellington, New Zealand; bArtibiotics, Wellington, New Zealand; cCapital and Coast District Health Board, Wellington, New Zealand; dDepartment of Primary Health Care and General Practice, University of Otago Wellington, Wellington, New Zealand; eRoyal New Zealand College of General Practitioners (RNZCGP), Wellington, New Zealand; fCapital Care Health Centre, Wellington, New Zealand; gUniversity of Otago, Dunedin, New Zealand

ABSTRACT
Drawing has played a key role in the development and dissemination of Medicine and Surgery, such as to share anatomy, pathology, and techniques for clinical interventions. While many of the visuals used in medicine today are created by medical illustration professionals, and by imaging techniques such as photography and radiography; many doctors continue to draw routinely in their clinical practice. This is known to be valued by patients, for example when making informed decisions about care. We surveyed doctors in New Zealand online regarding their use of drawing to explore the prevalence of this practice. 472 complete responses were obtained over 3 months. There were very high rates of drawing among responding doctors practicing in both medical and surgical specialties. Reasons for drawing are explored and included professional, collegial, and patient communication, supporting informed consent, clinical documentation, and for planning procedures. Widespread use of drawing in clinical practice, almost non-existent training or support for this in digital workflows, and high interest in resources to develop clinical drawing skills, suggest unmet training needs for this practical clinical communication tool.

ARTICLE HISTORY
Received 2 July 2022
Accepted 21 July 2022

KEYWORDS
Drawing; clinical communication; informed consent; visual communication; science communication; Comics

Introduction
Drawing as an art form has played a key role in the development and dissemination of Medicine and Surgery, particularly to share anatomy, pathology, and techniques for clinical interventions. While many of the visuals in medicine today are created by medical illustration professionals and imaging techniques such as photography and radiography; many doctors continue to draw routinely in their practice, such as when consenting patients for surgery, teaching, and documenting post-operative notes (Baldwin, 2019; Kearns, Kearns, & Paisley, 2020; Kearns, 2019; Lyon, 2016) Handmade drawings can be an immensely practical visual aid, created quickly to communicate specific information that is tailored to the recipient. Despite often being ‘sketchy’ or schematic in nature, they are powerful personalised distillations of key information that may be harder to communicate verbally or with text in isolation. The act of drawing is part of the experience also; this sets the pace that information is shared and allows for evolution of the art, further catering to the specific needs and questions of recipients.

Study of drawing in clinical practice has been relatively limited however, and little is known about the prevalence of such activity in contemporary healthcare among doctors (Lyon, 2016; Lyon & Turland, 2020) A survey of 100 surgeons in the United Kingdom (UK) found that a high proportion of responding surgeons drew in their clinical practice and valued drawing undertaken by their colleagues. Examples included explaining pathology results and interventions to patients, documenting operative findings and for teaching surgery to trainees (Kearns, 2019) Another survey-based study explored the materials used to prepare 244 patients for surgery in a tertiary General Surgery department in the United Kingdom (Kearns et al., 2020). Over half the patients received drawings from their surgeons during the consent process. Patients reported usefulness for supporting informed decision making, particularly when used to explain more complex operations.

In order to further the evidence base, which suggests wide use of drawing as a clinical communication tool in some healthcare systems, we attempted to estimate the prevalence of this practice by
doctors in New Zealand (NZ) via an online survey. We also explored reasons for drawing, and the receipt or interest in formal training in this skill.

**Methods**

The primary aim of the study was to estimate the prevalence of drawing in clinical practice amongst New Zealand doctors. The secondary aims included determining the proportion of New Zealand doctors who draw when studying, teaching, or in other aspects of their practice; to gauge drawing experience and previous exposure to drawing training; and to gauge interest in formal training resources for drawing as a clinical communication skill.

A brief online survey was designed using REDCap (Harris et al., 2009) and shared opportunistically by direct email, social media groups for doctors, hospital and society newsletters, and various channels who responded to invitations to distribute the survey to their members, such as Pacific Radiology, and the New Zealand Society of Otolaryngology, Head and Neck Surgery. A link to the survey was also shared via personal and professional networks of the study team, and by reaching out to departments, colleges, hospital contacts to consider sharing. Survey invitation messages encouraged recipients, and the survey encouraged respondents, to also consider sharing a link to the survey within their own networks to encourage cascading reach.

The survey invited voluntary and anonymous participation irrespective of whether the respondent used drawing in their practice. Interested persons who clicked a survey link were presented with an explanation of the study and how information would be used. In order to take part, they had to confirm eligibility (that they were a practising medical doctor in NZ) and consent to take part. The survey link was made live and promoted as described over a period of 3 months (1/6/21 to 30/8/21).

Drawing was defined as: ‘Making marks to create pictures on a 2-dimensional surface. This would include (but is not limited to) any type of picture drawn with a pen or pencil on paper, or finger/stylus/pen on a digital device such as an iPad. Drawings do not necessarily have to be detailed, accurate, artistic, or representational.’ Figure 1 shows examples that were provided to participants based on real drawings made by doctors.

**Analysis**

Simple descriptive statistics were used to summarise the findings. Chi-square tests, Relative Risk, and Fisher’s exact test were used to compare categories where this was done. Logistic regression was used in the sensitivity analyses.

**Ethics**

Ethics approval was obtained from the University of Otago Ethics Committee [H18/071]. Participants voluntarily consented to participation prior to completion of surveys.

**Results**

There were 478 responses to the survey of which 472 were usable after removing two test records, and four incomplete or invalid responses. In our survey, Medical specialities were made up of 66.6% female vs 33.1% male doctors, and surgical specialties were made up of 51.8% female vs 48.2% male doctors. A breakdown of respondent demography is available in Table 1. Respondents represented an experienced
sample of doctors across clinical and surgical specialities (Figures 2 and 3), with a mean duration practicing medicine of almost 20 years. The majority were in a vocational scope of practice (indicating full specialist registration). This group potentially represent up to 2.9% of the medical workforce based on the 2018 Medical Council of New Zealand (MCNZ) Workforce Survey (The New Zealand Medical Workforce, 2018). Ethnic representation of doctors in the 2018 Workforce Survey was similar to our survey for European (80.5 vs 79.0%), Māori (3.5% vs 4.0%), and Asian (15.0% vs 11.3%) doctors, but Pasifika (1.8% vs 0.2%) and Middle Eastern/Latin American/African (10.6% vs 1.1%) doctors were under-represented.

Table 1. Summary of respondent demographics.

| Demographic characteristic | Mean (SD, range) |
|----------------------------|-----------------|
| Age                        | 44.63 years (11.24, 24 to 77) |
| Years practicing medicine  | 19.44 (11.31, 0.05 to 52) |
| Scope of Practice          | Vocational scope 327 (69.3) |
|                            | In vocational training 90 (19.1) |
|                            | General scope and not in vocational training 48 (10.2) |
| Other                      | 7 (1.5) |
| Ethnicity                  | European 373 (79.0) |
|                            | Māori 19 (4.0) |
|                            | Pacific Island (Pasifika) 1 (0.2) |
|                            | Other 7 (1.5) |
| Gender                     | Female 297 (62.9) |
|                            | Male 173 (36.7) |
|                            | Other 1 (0.2) |

*Unless otherwise specified.

Figure 2 shows a breakdown of the areas of clinical practice represented by responding doctors. The 36 areas of medicine defined by the Medical Council of New Zealand (MCNZ) were offered as options to participants for answering this question (Types of vocational scope, 2021). These were categorised into a medical and surgical sub-group for analysis (Table 2). General Practitioners formed the largest single group of respondents (42.6%) for clinical specialities, and General Surgeons (24%) for doctors in surgical specialities. These were similar to proportions of the number of doctors by vocational scope for most clinical specialities reported in a 2020 MCNZ survey (Supplemental Table 1), although we note that some minor specialities each representing less than 1% of the workforce were not represented (Walker, 2022). The ‘other’ category represents specialities not deemed

Figure 2. Breakdown of respondents’ primary area of clinical practice. The ‘other’ category represents specialities not deemed clinical or surgical for the purposes of this survey, and includes Medical administration, Pathology, Public Health Medicine, and Other (unspecified).
Table 2. Response summary and comparison of medical and surgical groups.

| Response | All N=472* | Surgical N=110* (%) | Medical N=338* (%) | Relative Risk of Surgical vs Medical (95% CI) |
|----------|------------|---------------------|-------------------|---------------------------------------------|
| Do you ever draw in your clinical practice? = Yes | 430 (91.3) | 106 (96.4) | 301 (89.3) | 1.08 (1.02 to 1.14) |
| Do you ever draw when studying? = Yes | 377 (80.4) | 91 (83.5) | 265 (78.9) | 1.06 (0.96 to 1.17) |
| Do you ever draw when teaching? = Yes | 431 (91.3) | 108 (98.2) | 304 (89.9) | 1.09 (1.04 to 1.14) |

If you do not draw in your clinical practice, why not?

- I do not think that drawing can help with clinical practice | 7 (17.1) | 1 (25.0) | 6 (16.7) | 1.50 (0.24 to 9.52) |
- Time constraints | 7 (17.1) | 2 (50.0) | 5 (13.9) | 3.6 (1.01 to 12.86) |
- My art skills are lacking | 14 (34.1) | 10 (100.0) | 27 (78.8) | 3.6 (2.13 to 6.10) |
- Other | 20 (48.8) | 0 (0.0) | 19 (52.8) | NA |

In which aspects of practice have you drawn?b, (Lyon, 2016), are presented in Supplemental material A.

- The consultation is slower | 41 (9.5) | 10 (9.4) | 31 (10.3) | p = 0.21c |
- The consultation is faster | 152 (33.3) | 46 (43.4) | 98 (29.6) | |
- Not sure | 142 (33.0) | 32 (30.2) | 101 (31.6) | |
- No effect | 95 (22.1) | 18 (17.0) | 71 (23.6) | |

In your experience, how does drawing affect the time it takes to have a clinical consultation/patient interaction?d

- The consultation is slower | 41 (9.5) | 10 (9.4) | 31 (10.3) | p = 0.21c |
- The consultation is faster | 152 (33.3) | 46 (43.4) | 98 (29.6) | |
- Not sure | 142 (33.0) | 32 (30.2) | 101 (31.6) | |
- No effect | 95 (22.1) | 18 (17.0) | 71 (23.6) | |

Clinical documentation 232 (58.1) 71 (64.5) 190 (56.2) 1.15 (0.97 to 1.36) p = 0.12

- Other | 20 (48.8) | 0 (0.0) | 19 (52.8) | NA |

Clinical or surgical for the purposes of this survey, and includes Medical administration, Pathology, Public Health Medicine, and Other (unspecified).

Table 2 summarises participant responses to survey questions for the group overall, the sub-groups of those with a surgical versus medical primary area of practice, and results of the analyses of differences between responses for the two sub-groups.

Prose responses to ‘In which aspects of practice have you drawn?’ where respondents selected ‘Other’, are presented in Supplemental material A.

Discussion

Primary outcome

The prevalence of drawing in clinical practice among NZ doctors responding to the survey was very high at 91.3%. Although no previous prevalence data could be identified for doctors practicing in medical specialties; this result is similar to reported rates of 92.0% and 93.8% for surgeons working in the United Kingdom (Kearns, 2019), and Italy (Davide et al., 2021) respectively. As our study includes doctors practicing in both Medical and Surgical specialities, it adds to the literature with comparisons between these groups. Doctors with a primary surgical area of practice were 8% more likely to draw in clinical practice and 9% more likely to teach with drawings than their colleagues with a primary medical area of practice. Previous research with surgeons noted drawings were regularly used in the informed consent process and surgical documentation, which may help explain greater use compared to those with a primary medical area of practice (Kearns, 2019; Kearns et al., 2020).

Why do doctors draw?

Images can be efficient tools for communicating visuospatial information such as anatomy, and
relative size, position, and orientation. Drawing allows a doctor to filter complex medical information into a simplified schematic representation, tailored dynamically to the patient in real time (Kearns, 2019; Kearns et al., 2020). Almost all responding doctors who drew did so to communicate with patients such as when explaining disease or treatment. Twenty-five percent more doctors with a primary surgical area of practice used drawing to help overcome communication barriers such as language, education or health literacy, while 81% more doctors with a primary medical area of practice drew in their clinical notes. For the 26 doctors who indicated ‘Other’ reasons for drawing and explained this further, explanations included professional, collegial, and patient communication; to organise complex information visually such as treatment regimens and disease trajectories; to help patients understand the location of disease, anatomy, surgical procedures, and likely scarring; to help build rapport with children; to communicate with young patients with autism and neurodevelopmental conditions; planning surgical procedures; and creating diagrams to orientate surgical specimens to their pre-sectioned macroscopic appearances (Figure 4).

Drawings were noted to have value beyond information transfer. One General Practitioner reported they made drawings for patients to add to at home, giving the example of ‘what goes in your kere[sic] of wellness’, a kete being the Māori (Indigenous People of Aotearoa/New Zealand) term for basket. This shows a collaborative therapeutic use of drawing. Similarly, one paediatrician described drawing alongside young children to build rapport and put them at ease ‘I might draw a dog or an elephant’, and another noted ‘doodling with purpose’ when working with young people with oral language difficulties. One General Practitioner used drawings to express ‘collegial support, encouragement, or to say sorry’. Such creative and unexpected uses may not be captured in standardised evaluation of clinical practice or closed questioning, and so dynamic qualitative research methods will likely help researchers further explore this subject with more depth and nuance.

The non-drawers

While drawing appears to be a useful communication tool appreciated by the vast majority of responding doctors, not all respondents actively used this skill. Among non-drawing doctors; all of those with a primary surgical area of practice and about a third with a primary medical area of practice cited lack of drawing skills as a reason. A minority of 25% (surgical) and 16.7% (medical) respondents in this group did not think drawing could help in their practice. For the doctors who indicated ‘other’ as the reason for not drawing, reasons including paperless
digital workflows impeding or preventing incorporation of physical drawings; the accessibility of clear visual representations online e.g., by internet image search; that they used radiology images for visual communication; had minimal or no clinical contact; and one had not thought of drawing before.

Drawings need not be created in their entirety by a doctor. In a survey of UK surgeons some respondents described the use of drawing on standardised template art which could save time and help those lesser skilled at drawing (Kearns, 2019). Urology research that found marking standardised bladder diagrams at the point of bladder tumour diagnosis was a significant factor associated with fewer disease recurrences following transurethral resection of bladder tumour (TURBT) for members of the Scottish Bladder Cancer QPI Research Collaborative, 2020 (Brausi, 2013). Use of these standardised diagrams is currently an evidence-based recommendation in the 2021 European Association of Urology guidance for the management of non-invasive bladder cancer (Babjuk et al., 2021). Other areas of clinical practice that may involve drawing on standardised visual templates include arterial doppler ultrasound reports, and diagrams of the tympanic membrane, vulva, and retina in otolaryngology, gynaecology, and ophthalmology specialities respectively.

Lyon and Turland interviewed medical professionals who drew in depth. An Occupational Therapist who took part in their study described that standardised templates had led to a decline in drawing in their profession (Lyon & Turland, 2020). Similar concerns have been expressed in primary education regarding loss of hand-writing and reading skills among students with increased dependence on electronic interfaces. There is evidence from kindergarten children showing that writing with a pencil led to better letter recognition and visuomotor skills than keyboarding, (Mayer et al., 2019) and that learning letters by drawing them using a pen led to better writing and word reading skills (Kiefer et al., 2015). There may be a risk of losing the art and opportunities of drawing in clinical practice with adoption of paperless electronic systems in healthcare if they cannot facilitate this method of communication.

Template illustrations can be restrictive in what is presented, and how far they may be tailored to patient or clinician needs. Also, the final visual produced may not be the most valuable aspect of a drawing. In the process of creation, information can be built up over time, allowing explanation of more complex concepts (like a surgical procedure) in manageable chunks. A drawing can also be actively altered to show change over time (e.g., anatomy before and after a disease process, and with medical intervention). The final drawing alone, like the last page of a book, does not represent the whole experience of creating or witnessing a drawing being produced. This may help explain why the technical artistic merits of drawings are not necessarily important in clinical practice, (Kearns et al., 2020) as the actual final appearance is just one aspect of a multi-sensory interaction. Some respondents commented on the value of drawings to build trust with patients such as when drawing animals for children. The creation of these drawings facilitated clinical interactions in a way that is not easy to appreciate from what the final combination of marks represents.

Drawing is not inherently appropriate however; some respondents in a survey of UK surgeons warned of the dangers of relying too heavily on drawing if it replaced clear description in surgical documentation, noting that drawings might be more open to misinterpretation and easier to fabricate than photography or video if used in a medico-legal context (Kearns, 2019). Further study is needed to determine where drawings are appropriate, valued, and most effective.

Adapting to a paperless electronic future

One participant, whose primary area of practice was emergency medicine, expressed frustration that drawing in clinical documentation could not be added to electronic notes, giving the example of ‘location/size of a corneal abrasion’ which they felt was effectively communicated visually. Under the NZ Code of Health and Disability Services Consumers’ Rights, Code of Health and Disability Services Consumers’ Rights, every patient has the right to effective communication in a form, language, and manner that enables them to understand the information provided (Code of Health and Disability Services Consumers’ Rights, 2021). There is evidence that patients value information in, or supported by, the medium of drawing (Davide, Greta, Lucia, Giancario, & Bosco, 2021; Kearns et al., 2020). Facilitating the option of drawing in electronic systems for those who wish to do so, may help doctors uphold these patient rights. As paperless electronic solutions increasingly become the norm in healthcare, consideration should be given in software development regarding how to create, capture, and integrate drawings in electronic notes and workflows. This will ensure that this method of dynamic and tailored clinical communication is not lost.

Consultation speed

Doctors who reported drawing in their clinical practice were asked about how this affected the time to have a clinical consultation or patient interaction.
35.3% felt consultations were faster, 9.5% felt consultations were slower, 33.0% were not sure, and 22.1% felt this had no effect. This provides preliminary subjective evidence that drawing may facilitate more timely consultations. Greater efficiency in care is broadly valuable in under-resourced and busy clinical environments, making this line of enquiry interesting for future research.

**Training in drawing skills**

Although the majority of respondents (91.3%) used drawing in aspects of their clinical practice, only a minority (2.5%) had received formal training for this in their medical training, and over half (58.1%) expressed an interest in teaching resources for this communication skill (including over a third of those who did not currently draw). This indicates unmet training needs for a widely used clinical communication skill.

**Limitations**

Selection bias may have skewed responses towards those with interest in or strong opinions on drawing in clinical practice. Survey distribution was uncontrolled but not random in order to facilitate maximum reach and achieve a convenience sample of doctors in NZ. This may explain underrepresentation in some aspects of the expected demography based on the 2018 MCNZ workforce survey, and variation in reported primary areas of practice. Results may therefore not be generalisable to all doctors in NZ or those in other healthcare systems.

Sub-comparisons of medical and surgical specialities were made by subjective grouping of respondents’ primary area of practice, particularly for mixed medical and surgical specialities such as Obstetrics and Gynaecology, Ophthalmology, and Dermatology, which in our survey were treated as surgical, in line with previous work (Kearns, 2019). Others may disagree with this classification. Grouped rather than by-speciality analysis was necessary given the sample size, but may help those planning future studies direct efforts towards specialities with higher use of the skill, and who may be under supported in training. We note that significant differences between individual specialities may be cancelled out by such an approach.

**Conclusions**

We found very high prevalence of drawing in clinical practice amongst 472 doctors in Aotearoa New Zealand, which to the authors’ knowledge, is the largest survey of its kind to date. This builds on previous research with data from another healthcare system, demonstrating high rates of drawing among doctors practicing in both medical and surgical specialities. Widespread use of drawing in clinical practice, almost non-existent training, and high interest in resources to develop clinical drawing skills, suggest unmet training needs for this practical clinical communication tool.

**Acknowledgements**

The authors would like to thank those who took part in, and helped to distribute the survey, making this research possible.

**Disclosure statement**

No potential conflict of interest was reported by the author(s).

**ORCID**

Článek Kearns @ http://orcid.org/0000-0003-1254-8287
Samantha Murton @ http://orcid.org/0000-0002-0150-5567
Karen Oldfield @ http://orcid.org/0000-0003-4734-8488
Augustus Anderson @ http://orcid.org/0000-0003-4062-1875
Allie Eathorne @ http://orcid.org/0000-0002-0706-044X
Richard Beasley @ http://orcid.org/0000-0003-0337-406X

**References**

Babjuk M, Burger M, Compérat E. (2021). EAU Guidelines on Non-muscle-invasive Bladder Cancer (TaT1 and CIS). https://uroweb.org/guideline/non-muscle-invasive-bladder-cancer/

Baldwin, A.J. (2019). The historical relationship between art and plastic surgery: Is this relationship still relevant to the modern plastic surgeon? Journal of Plastic, Reconstructive & Aesthetic Surgery, 72, 1436–1447. doi:10.1016/j.bjps.2019.03.026

Brausi, M. (2013). Transurethral resection of bladder cancer: A simple and diffusely-performed technique but with controversial outcomes. Urologia, 80, 127–129. doi:10.5301/RU.2013.11288

Code of Health and Disability Services Consumers’ Rights. (2021). https://www.hdc.org.nz/your-rights/about-the-code/code-of-health-and-disability-services-consumers-rights/

Davide, S., Greta, C., Lucia, T., Giancario, D.V., & Bosco, C. (2021). To draw or not to draw: Informed consent dilemma. Primary Health Care, 5, 1–6. doi:10.15761/HPC.1000211

Harris, P.A., Taylor, R., Thielke, R., Payne, J., Gonzalez, N., & Conde, J.G. (2009). Research electronic data capture (REDCap)—A metadata-driven methodology and workflow process for providing translational research informatics support. Journal of Biomedical Informatics, 42, 377–381. doi:10.1016/j.jbi.2008.08.010

Kearns, C. (2019). Is drawing a valuable skill in surgical practice? 100 surgeons weigh in. Journal of Visual Communication in Medicine, 42, 4–14. doi:10.1080/17453054.2018.1558996

Kearns, C., Kearns, N., & Paisley, A.M. (2020). The art of consent: visual materials help adult patients make informed...
choices about surgical care. *Journal of Visual Communication in Medicine*. Published Online December, 43, 76–78. doi:10.1080/17453054.2019.1671168

Kiefer, M., Schuler, S., Mayer, C., Trumpp, N.M., Hille, K., & Sachse, S. (2015). Handwriting or typewriting? The influence of pen or keyboard-based writing training on reading and writing performance in preschool children. *ACP*, 11, 136–146. doi:10.5709/acp-0178-7

Lyon P. (2016). Visualising and communicating illness experiences: drawing, the doctor-patient relationship and arts-health research. https://research.brighton.ac.uk/files/421340/Lyon,%20P.%20Visualising%20and%20communicating%20illness%20experiences%20FINAL%20UoB%202016.pdf

Lyon, P.M., & Turland, M. (2020). Visualising the body: health professionals’ perceptions of their clinical drawing practices. *Med Humanities*, 46, 454–463. doi:10.1136/medhum-2019-011675

Mariappan, P., for members of the Scottish Bladder Cancer QPI Research Collaborative (2020). Enhanced quality and effectiveness of transurethral resection of bladder tumour in non–muscle-invasive bladder cancer: A multicentre real-world experience from Scotland’s quality performance indicators programme. *European Urology*, 78, 520–530. Johnston, A., Padovani, L., Clark, E., Trail, M., Hamid, S., Hollins, G., & Hendry, D. doi:10.1016/j.eururo.2020.06.051

Mayer, C., Wallner, S., Budde-Spengler, N., Brauner, S., Arndt, P.A., & Kiefer, M. (2019). Literacy Training of kindergarten children with pencil, keyboard or tablet stylus: The influence of the writing tool on reading and writing performance at the letter and word level. *Front Psychol*, 10, 3054. 2020. doi:10.3389/fpsyg.2019.03054

The New Zealand Medical Workforce (2018). https://www.mcnz.org.nz/assets/Publications/Workforce-Survey/434ee633ba/Workforce-Survey-Report-2018.pdf

Types of vocational scope. (2021). *Medical Council of New Zealand*. https://www.mcnz.org.nz/registration/scopes-of-practice/vocational-and-provisional-vocational/types-of-vocational-scope/

Walker C. (2022). *The New Zealand Medical Workforce in 2019 Appendix 2*. https://www.mcnz.org.nz/assets/Publications/Workforce-Survey/6be731ea72/Workforce-Survey-Report-2019.pdf