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The initial impact of COVID-19 on Australasian sonographers part 2: Changes to sonographic examination protocols and access to personal protective equipment

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Abstract

Introduction: COVID-19 brought with it the requirement for healthcare workers to limit community transmission of the virus as much as possible by limiting patient contact and wearing Personal Protective Equipment (PPE). This study aimed to capture the initial adaptations to sonographic examination protocols within ultrasound departments and sonographer access to PPE.

Methods: An online survey was used to gather data on sonographer reflections of sonographic examination protocol changes seen in their departments and access to PPE between the 11th of March 2020 and the 14th of June 2020.

Results: To reduce the time sonographers spent with the patients and hence reduce the risk of exposure to COVID-19, sonographers reported adjustments to sonographic examination protocols including their duration and scheduling. Access to PPE was reported as poor.

Conclusion: Numerous sonographic examination protocol changes were observed within ultrasound departments in Australasia in the initial response to COVID-19. Access to PPE was varied along with sonographer feelings around the impact of these changes.

KEYWORDS
Australasian, COVID-19, impact, personal protective equipment, protocol changes, sonographers

1 | INTRODUCTION

COVID-19 was characterised as a global pandemic by the World Health Organisation (WHO) on the 11th of March 2020,[1] with the first Australian case being reported on the 25th of January 2020.[2] Australia and New Zealand adopted an early response which appears to have been successful in limiting the impact in these countries when compared to the impact globally. This article is part two of a survey series which evaluates and reports on the initial impact of COVID-19 across the Australasian sonographer community. Part one of this survey series evaluated and reported changes in numbers of sonographic examinations performed, examination types, and the changes in sonographer working hours.[3]

Evidence-based sonographic examination protocols are recommended by imaging departments and the professional bodies for sonographers, namely the Australasian Sonographers Association (ASA) and Australasian Society for Ultrasound in Medicine (ASUM). In the face of a pandemic and the necessity for physical distancing, changes were likely to be required to limit patient contact. Several modifications in relation to sonographic examination protocols were adopted by imaging departments to cope with the initial impact of COVID-19 to protect both the staff and the patients during April and

May 2020.[3] The reporting or documentation of these changes are unclear or unknown. Around the same time, the WHO guidelines recommended personal protective equipment (PPE) for all healthcare workers including sonographers, although there have been several reports of a shortage or lack of PPE for healthcare workers.[4] Sonographer specific data was unavailable.

A study by Devani, 2012[5] investigating the willingness of healthcare workers to continue to work in public health emergencies, found that the availability of PPE and confidence in one's employer were strong influencing factors for staff during influenza outbreaks. It was therefore deemed essential by the research team to investigate similar impacts of the COVID-19 outbreak on sonographers in Australia and New Zealand. Knowledge of the sonographic examination protocol changes and availability of PPE to medical sonographers during the initial stages of the COVID-19 pandemic would be beneficial for future planning.

This article reports the changes in ultrasound examination protocols instigated by imaging departments as a result of the COVID-19 pandemic, the availability of PPE for sonographers and changes to the scheduling of appointments in the initial stages of the COVID-19 pandemic (11th March 2020–14th June 2020).

2 | METHODS

This article is part two of a three-part series reporting the results of an online survey which evaluated the initial impact of COVID-19 on Australasian sonographers. Institutional human research ethics approval (protocol number 203084) was granted prior to the commencement of the study. Accredited sonographers across Australia and New Zealand were invited to participate in the study.

An online survey was developed to collect data relating to participant demographics, changes to sonographic examination protocols and access to PPE. Further free text response questions were posed to evaluate sonographer perceptions to these sonographic examination protocol changes and how these perceptions affected their routine clinical work. The survey questions were developed and sent to the ASA and ASUM boards for comment and feedback, and subsequently adjusted accordingly.

The survey was distributed as an anonymous internet survey using an online survey tool (Survey Monkey Inc©, San Mateo, CA) via the online newsletters, social media, and websites of the ASA and the ASUM. It was released on the 8th of May 2020 and closed on the 14th of June 2020. An information sheet was present as the first page of the survey and participation was assumed consent.

3 | RESULTS

These results are reflective of changes as reported by sonographers between the 11th of March and the 14th of June 2020 comprising the initial stages of the COVID-19 pandemic. A total of 444 sonographers responded to the survey, either in full or partially. Of these, 89% ($n = 396/444$) were female and 11% ($n = 48/444$) were male. Student sonographers comprised 9% of the survey participants ($n = 43/444$). In relation to workplace, 60% ($n = 266/444$) were employed in private imaging practices, 19% ($n = 86/444$) in public hospitals and 21% ($n = 92/444$) employed in both private and public hospitals. This paper discusses the sonographic examination protocol changes, sonographer perceptions to these changes, impact on their routine work and the availability of PPE within departments as reported by sonographers.

3.1 | Sonographic examination protocol changes

Participants reported on changes to sonographic examination protocol and/or scheduled timings of sonographic examinations and examination durations for their departments related to COVID-19. Participants were asked to report via a free text response on any changes to sonographic examination protocols, examination durations and/or scheduled timing of bookings (i.e., timing of initial examinations or times between subsequent examinations) for their departments related to COVID-19. Descriptive, qualitative thematic analysis was performed on these answers by four members of the research group (BO, SM, KL, JC). Three main themes emerged from these answers; (1) efforts to reduce time spent with the patient, (2) efforts to reduce the immediate risk of exposure and (3) alterations on time of examination booking and intervals between examinations.

3.1.1 | Efforts to reduce time spent with the patient

A total of 30% of sonographers ($n = 135/444$) stated that their departments made protocol changes towards reducing the time spent with a patient to reduce exposure risk. 8% ($n = 35/444$) of sonographers mentioned that no changes to protocols were made.

The main protocol changes included targeted sonographic examinations to answer only "the clinical question," rather than completing full ultrasound protocols which require more time to be spent with the patient. Other adaptations included instructing sonographers to perform limited physical assessments of their patients such as clinical tests to elicit tenderness of a particular area. In instances where incidental findings were seen, these were documented but the sonographic examination itself was not extended to evaluate the abnormality, which would otherwise occur in a routine setting. Further approaches to reducing patient contact time included placing time limits on sonographic examinations to a maximum of 15-minutes per patient ($n = 7$), or "tagging in" a second sonographer after the 15-minute time limit had been exceeded ($n = 2$). Several cardiac sonographers ($n = 5$) reported truncated sonographic examination protocols with offline analysis or the use of less advanced techniques rather than 3D or strain echocardiography. Time spent performing vascular sonographic examinations was also limited, or only one limb was examined per session as reported by some sonographers ($n = 7$). In some circumstances where patients required additional sonographic

assessment, they were booked over consecutive days with a 30-minute limit each day ($n = 3$). Extensive vascular cases were reportedly being sent to computed tomography (CT) instead ($n = 2$), along with patients presenting for hernia examinations ($n = 1$) and cases of suspected renal calcification ($n = 1$).

For women's health examination, some departments ($n = 3$) ceased performing transvaginal sonographic examinations, limiting examinations to transabdominal alone. When performing pelvic sonographic examinations, assessment of the kidneys was omitted in instances where they were routinely included in the protocol ($n = 2$). Reductions to overall obstetric sonographic examination times were reported through a range of modifications to normal established sonographic examination protocols (Table 1).

Finally, from student sonographers' perspectives, required reductions in contact time between patient and sonographer heavily impacted their ability to meet training requirements. Some departments only allowed 20 min of patient contact per appointment, which impacted on observation and hands-on scanning times for student sonographers ($n = 5$). Several students ($n = 9$) reported a cessation in their training programs in order to ensure efficient examination times and to limit staff time spent with patients and colleagues. Other students ($n = 5$) reported that they were limited in the types of examinations they could perform and were no longer allowed to complete longer examinations such as the 18–22 week morphology examination.

TABLE 1 Strategies used to reduce duration of obstetric sonographic assessments

Reducing measurements and annotations
• Deferring annotations or measurements until after the sonographic examination. • Minimal and essential annotations only used, such as left and right to denote fetal situs. • Only the deepest pocket measured to ascertain amniotic fluid level rather than the traditional four quadrant Amniotic Fluid Index. • A single Doppler trace only obtained in obstetric examinations in low-risk cases
Reducing number of images taken
• Recording strictly essential images, for example, only the basic growth measurements recorded: Bi-Parietal Diameter (BPD), Head Circumference (HC), Abdominal Circumference (AC) and Femur Length (FL), with sonographers indicating that this was part of a "modified obstetric COVID-19 protocol" on the worksheet. • Capturing with cine loop rather than static images, for example, the use of cine loops for the hands and feet in morphology examinations instead of including accompanying images as well. • Only an optimal four-chamber view instead of outflow tracts being imaged in the third trimester. • The cessation of 3D and 4D imaging in obstetric patients.
Other ways to reduce time spent on examination
• Limiting image optimisation. • Limiting morphology to 20-minute sessions and scheduling a second session on another day to obtain further images. • In imaging practices where cervical length was routinely measured through transvaginal examinations in morphology examinations, the protocol was modified to perform transvaginal measurements only if clinically indicated and if the transabdominal examinations were deemed suboptimal to visualise the internal os or the inferior edge of the placenta. • No call backs for missed images or incomplete examinations.

3.1.2 | Efforts to reduce the immediate risk of exposure to COVID-19

Efforts were made to reduce the immediate risk of exposure of sonographers to patients potentially infected with COVID-19. Seventy three percent of respondents ($n = 325/444$) reported that their departments reduced the total number of people allowed in a sonographic examination room, including partners, accompanying children, and student sonographers. At various sites ($n = 26$) partners of obstetric patients were either not allowed within the sonographic examination room or were only allowed within the room for a limited amount of time. One participant reported that male sonographers were no longer allowed to perform breast or pelvic ultrasound examinations, in order to avoid the need for a chaperone as an extra person in the room. Student sonographers were only allowed to perform sonographic examinations on patients if they could complete them autonomously, according to their advancement in training ($n = 2$). Conversely some sonographers ($n = 3$) reported that they were required to extend sonographic examination times to make longer obstetric videos because the partner was not allowed in the room.

To limit the immediate risk to imaging department staff of exposure to COVID-19, patients were asked not to touch or fill in forms, with sonographers or other clinical staff doing it for them ($n = 2$), or electronic forms were used as an alternative to paper ($n = 1$). Patients who presented for examinations with inadequate preparation, such as an empty bladder, were either re-booked, or examined as they presented ($n = 4$). This worked to limit the number of people in the waiting room and the time the patients spent in the clinics.

More rigorous disinfection of equipment and rooms was required between patients, sometimes including all transducers, the ultrasound machine, and all exposed surfaces including chairs and doorknobs, as reported by 17% sonographers ($n = 74/444$). One sonographer reported that their department allowed only the specific ultrasound transducer being used for the examination to be present in the room to avoid repeated cleaning of all the unused transducers.

Some departments ($n = 8$) required patients to wash their hands before and after sonographic examinations and required them to always wear gloves and masks ($n = 3$). Several sonographers ($n = 6$) reported that they felt they had not been allowed sufficient cleaning and disinfecting time between patients, whilst others ($n = 7$) reported that they were provided sufficient extra time.

Efforts to decrease the contact risk for sonographers during examinations were reported in patient positioning adaptions; for example, patients were scanned whilst being rolled away from the sonographer to reduce direct contact with patient's breath during expiration. Alternatives included asking patients not to talk during procedures, not having them hold their breath to avoid them

"blowing heavily" when they breathed out and eliminating coughing manoeuvres for hernia studies.

Inpatients suspected of having COVID-19 were reportedly either being scanned on portable machines within their rooms ($n = 4$), or on a dedicated machine for COVID-19 suspected or positive patients ($n = 3$). Some sonographers ($n = 4$) stated that in their departments COVID-19 patients were booked only late in the day ($n = 1$) or had only targeted examinations (n-3) or a timed 15-minute examination time ($n = 3$). Additionally, COVID-19 positive patients were only scanned if the examination was clinically essential ($n = 3$). At one site, patients referred for transoesophageal echocardiograms (TOE) were required to have a negative COVID-19 swab prior to their appointment. Nine respondents reported that all COVID-19 positive or suspected patients were examined with the sonographer in full PPE.

Due to time restrictions placed on sonographic examinations, and measures taken to reduce patient contact, sonographer ergonomics were negatively impacted ($n = 4$) To accommodate physical distancing requirements, sonographers were required to abduct their arms out further than recommended, putting increased strain on the rotator cuff of the shoulder. Furthermore, the increased number of bedside/portable sonographic examinations before performed resulted in sub-optimal positioning of the sonographer relative to the patient and ultrasound unit, increasing the risk of musculoskeletal work-related disorders.

3.1.3 | Alteration on time of examination booking and intervals between examinations

Sonographers indicated that there were changes to the timing, or even the postponements, of sonographic examinations. For example, one sonographer reported infant hip examinations being deferred until 8 or 10 weeks of age instead of the routine 6-weeek assessment, with follow up examinations after a further 8 weeks. Another sonographer reported a change in infant hip examinations to be performed every 10 weeks, rather than every six. Third trimester obstetric sonographic examinations were altered from being performed at 28, 32, and 36 weeks to 28 and 34 weeks only ($n = 2$). Additionally, some departments ($n = 3$) established that dating examinations with no concerning indications should be deferred until 12 weeks. Others ($n = 2$) did not perform dating examinations if the last menstrual period (LMP) was known. One sonographer reported that their department required midwives to obtain serial Beta-Human Chorionic Gonadotropic (B-HCG) levels in cases of first trimester bleedings before allocating an ultrasound appointment to avoid performing unnecessary ultrasound examinations. Some departments ($n = 3$) ceased follow up sonographic assessment for fetal growth if the initial fetal growth examination was normal.

3.2 | Sonographer perceptions around sonographic examination protocol changes

A series of questions seeking sonographers' perceptions of sonographic protocol changes, in the initial stages of the COVD-19 pandemic received an 83% response rate ($n = 367/444$). Most sonographers felt they were not being rushed to complete their examinations (24% never, 27% rarely, 29% sometimes, 16% often, 4% always) and that COVID-19 was not strongly impacting how well they executed their jobs (6% always, 13% often, 33% sometimes, 27% rarely, 21% never). Twenty seven percent ($n = 5/18$) of those in New Zealand reported that they often or always felt that COVID -19 was impacting how well they did their job. Within Australia, there was a statistically significant difference ($p = 0.003$) between states (Figure 1). Twenty-four percent of those in Queensland ($n = 12/51$) and 23% ($n = 19/82$) of those in Victoria often or always thought COVID-19 was impacting how well they did their jobs. This is in comparison to no impact reported in Western Australia (3%, 1/32), Tasmania (0%, 0/4) and the Northern Territory (0%, 0/2).

Sonographers working in private practices (20%, $n = 45/225$) felt COVID-19 impacted their clinical practice more than those in public hospitals (15%, $n = 11/73$). When asked whether people felt they were interacting less with their patients, there was another statistically significant difference between states ($p = 0.020$). Nearly half of sonographers in South Australia (42% $n = 14/33$) and Victoria (42% $n = 34/82$) noted a negative impact on their time interacting with patients (Figure 2).

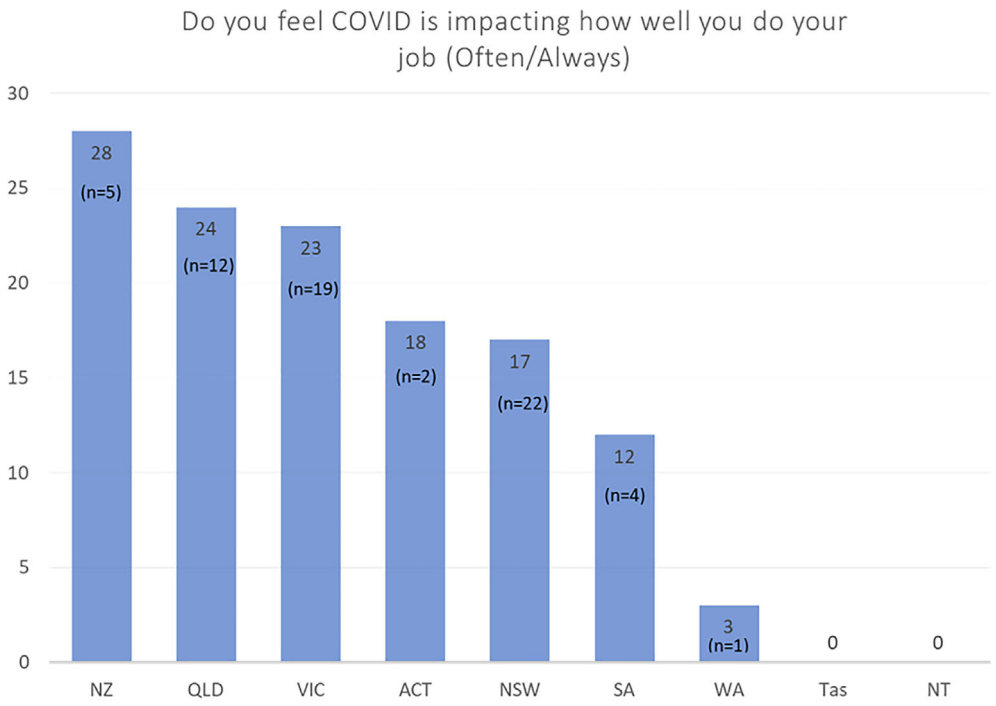
3.3 | Access to personal protective equipment

Sonographer access to PPE was a primary concern in the initial stages of the COVID-19 pandemic, particularly given the nature of the role which sees sonographers needing to be in contact with patients for extended periods of time. Participants were asked to report their experiences with use and access to PPE.

Changes to increase the use of PPE was reported by sonographers with 381 sonographers answering all or part of this section of the survey. For the question on access to protective equipment, 96% of sonographers ($n = 359/381$) reported having access to gloves, 90% ($n = 335/381$) to masks, 60% ($n = 225/381$) to gowns, 49% (n = 184/381) to eye protection and 7% ($n = 25/381$) to booties. Unconditional access to this equipment was reported by only 37% of sonographers ($n = 136/372$). Fourty-five percent ($n = 169/372$) of respondents had conditional access depending on the status of the patient, and 18% ($n = 68/372$) reported conditional access depending on the work site (private practice or public hospital; tertiary care unit, or general imaging department). Just under 4% of participants ($n = 14/350$) reported that they were shielded from their patients in the form of a makeshift screen between the ultrasound machine and the patient.

Regarding the appropriateness of equipment, six participants (2%, 6/300) reported that their protective equipment was out of date and 24% ($n = 88/366$) reported that their protective equipment was not appropriate when compared to prescribed standards for COVID-19 protection.

Sixty percent ($n = 229/382$) of the respondents stated that they had been offered adequate personal protection at work. Several sonographers ($n = 42$) indicated they were rationed to one mask per



Key: NZ = New Zealand, QLD = Queensland, Vic = Victoria, ACT = Australian Capital Territory, NSW = New South Wales, SA = South Australia, WA = Western Australia, Tas = Tasmania, NT = Norther Territory

FIGURE 1 Percentage of sonographers by state who felt that COVID-19 was often or always impacting how well they did their jobs (number of participants = 367)

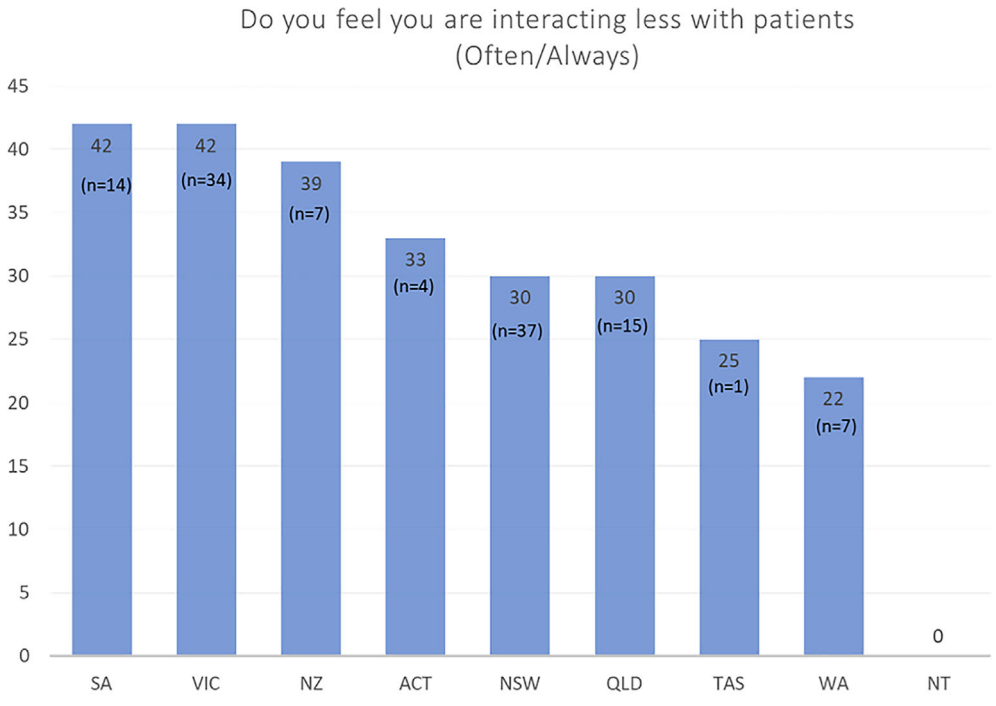


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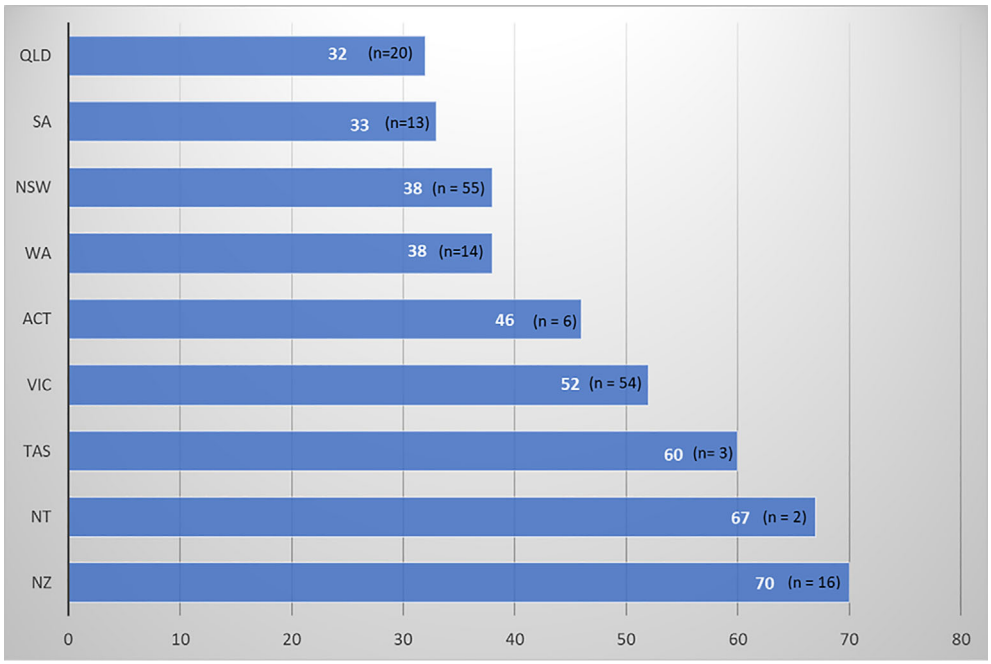
FIGURE 2 Percentage of sonographers by state who often or always felt they were interacting less with their patients (number of participants = 362)

sonographer per day, while some sonographers ($n = 4$) reported that they had to source their own masks if they wanted one.

Access to PPE was relatively consistent across the geographical locations apart from statistically significant differences seen with bootie access ($p = 0.021$) and eye protection ($p = 0.004$). New Zealand and the Northern Territory had the highest access to both eye protection and booties. In contrast, zero respondents from Western Australia or Tasmania reported access to booties (Figures 3 and 4).

Other statistically significant differences were seen between sonographers working in public hospitals compared to those in private



Key: NZ = New Zealand, QLD = Queensland, Vic = Victoria, ACT = Australian Capital Territory, NSW = New South Wales, SA = South Australia, WA = Western Australia, Tas = Tasmania, NT = Norther Territory

FIGURE 3 Percentage of sonographers by state reporting access to eye protection (number of participants = 444)

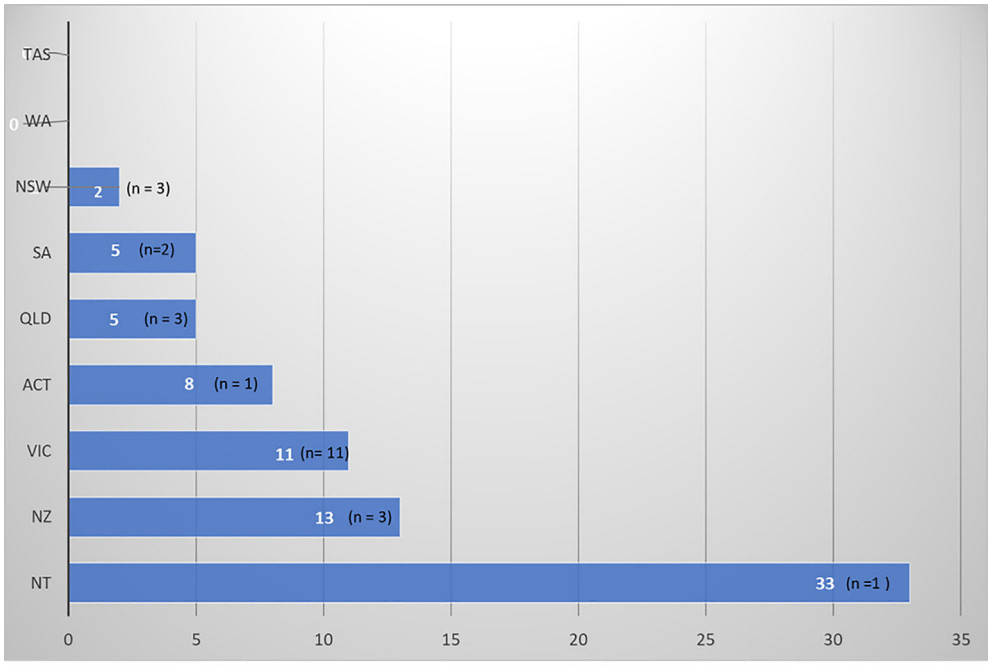


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FIGURE 4 Percentage of respondents by state who reported access to booties (number of participants = 444)

practices. There was a higher percentage of access reported by sonographers working in public hospitals across all types of protective equipment (Figure 5). Interestingly, there was a statistically significant difference (p = <0.001) to the type of access to PPE between the two groups, with 43% (n = 99/228) of respondents who worked in private practice reporting unconditional access compared to only 18% (n = 14/76) for those in public hospitals. Access to PPE for sonographers in public hospitals was predominantly conditional and dependent on the status of the patient (72%, 55/76), that is, whether the patient was at high risk of COVID-19 or not (Figure 6).

4 | DISCUSSION

Significant changes were made to sonographic examinations protocols within individual imaging departments to limit the community

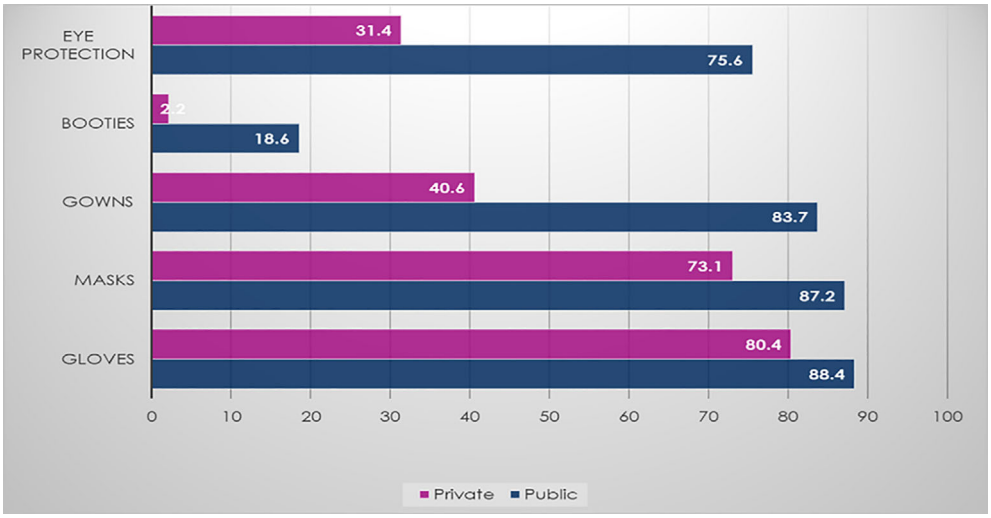

FIGURE 5 Percentage access public hospital versus private practice sonographers to different types of protective equipment (Total number of sonographers in private practice = 228, total number of sonographers in public hospitals = 76)

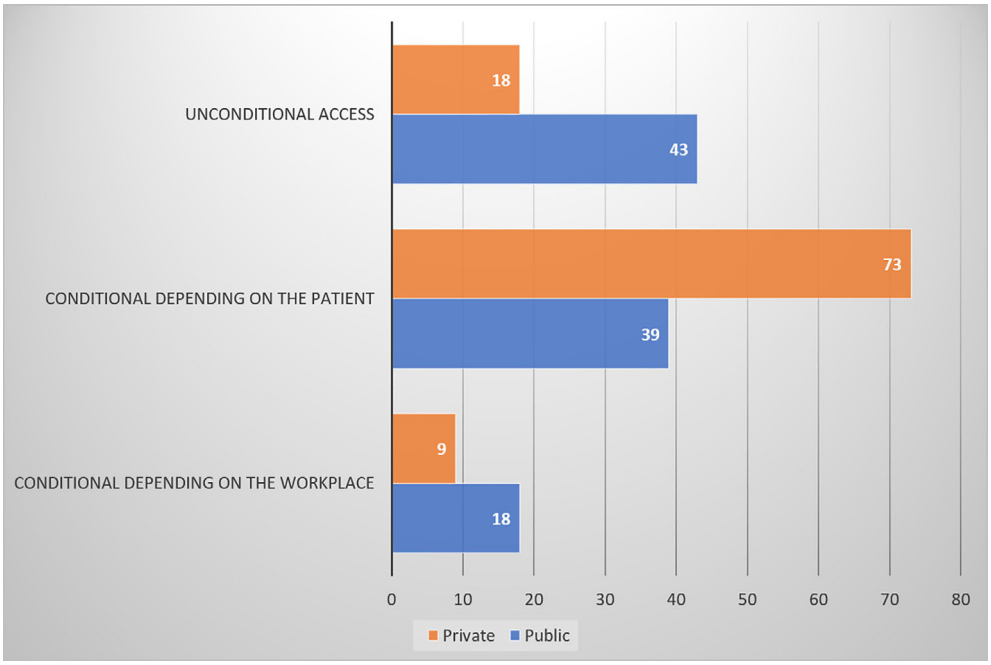

FIGURE 6 Restrictions on access of public hospital versus private practice sonographers to protective equipment. Total number of sonographers in private practice = 228, total number of sonographers in public hospitals 76

transmission of COVID-19. It is important to note on that this data is indicative of the early impact of COVID-19 in Australia and New Zealand and captures sonographers' reflections and opinions between the 11th of March and the 14th of June 2020.

The demographic data within this study was well distributed and representative of the Australasian sonographer population in comparison with data provided by the Australian Sonographers Accreditation Registry, although New Zealand respondents comprised of only 5% ($n = 23/443$).

Changes to sonographic examination protocols were made by departments in an effort to decrease examination times, increase cleaning procedures, and provide protective measures to staff to reduce the risk of community transmission. In the absence of the regulation of the sonography workforce and the inability to enforce changes in protocol guidelines, these changes were dealt with on a department-by-department basis with little uniformity and much inconsistency across varied imaging practices.

The scheduling of sonographic examinations was also seen to change, for example the increase in time between paediatric hip examinations and reducing the number of third trimester follow up examinations. Additionally, some examinations were not completed at all, such as was seen in the deferral of dating examinations until 12 weeks or the requirement for serial Beta HCG testing prior to the examination. In a profession which should ideally avoid non-essential examinations, the question is posed as to whether this should always be the case, however the COVID-19 pandemic arguably alters the risk

versus benefit scenario. Future research in this project will see if these intervals return to their pre-COVID-19 levels in time.

Sonographer access to PPE also varied depending on the type; with 90% of sonographers having access to gloves, 75% to masks, 60% to gowns, 49% to eye protection and 7% to booties. Of those who had access, 24% reported that the equipment was not appropriate for COVID-19 protection when compared to recommended standards. Comparison to other healthcare workers is difficult due to a sparsity of literature however a large study amongst Australian frontline nurses revealed 63% of nurses having sufficient access to a masks compared to the 75% reported amongst sonographers.[6] Similar reports of nurses providing their own PPE were also made within this study.[6] A national shortage of PPE was well documented in the early stages of the COVID-19 pandemic and future research will show if these figures change across subsequent surveys. Past research demonstrates that healthcare workers' willingness to work during an influenza outbreak is associated with the availability of PPE.[7] This study showed that in some cases, PPE was not readily available and that 40% of sonographers felt that they had not been offered adequate personal protection. Paper 1 in this series reported that many sonographers chose to reduce their work hours[4] and these two things may be related. In North America, it was reported that the lack of available PPE led to the use of PPE that was not of adequate protection against COVID-19.[7]

Regarding locations, sonographers in New Zealand most felt the changes adversely affected how well they did their job, this was closely followed by Queensland and Victorian sonographers. Several sonographers ($n = 16$) indicated that they were interacting less with their patients and that this was impacting patient care. This finding was echoed amongst frontline nurses where 34% of respondents felt quality of care was significantly or slightly worse than before COVID-19.[6]

Student sonographers appeared to be impacted the most. With the necessity to limit community exposure by limiting the amount of time spent with patients and the number of people in a scanning room, several departments were forced to reduce the amount of training student sonographers were receiving or cease training positions all together. Whilst the university system appeared to adopt an online learning experience relatively easily for students, clinical learning whilst maintaining safety presents a more challenging situation. The removal of students from clinical medical situations has been well documented within the literature as medical and radiology students are removed from their frontline positions.[8,9] Suggestions to overcome this include better access to PPE, the use of telemedicine and video interaction with patients and the increase in virtual learning experiences.[8,9]

Participant numbers from the Northern Territory, Western Australia, Tasmania, and New Zealand were low, so these results should be viewed with caution. The perceptions of how the changes during COVID-19 impacted routine work is based on sonographers' self-reports only, presenting another limitation to this study.

Future research is scheduled to capture the interim changes experienced during COVID-19 and the changes following the distribution of a vaccine.

5 | CONCLUSION

In an effort to reduce community transmission of COVID-19, departments have reacted in multiple ways. This includes the modification of existing sonographic examination protocols to reduce examination times and changes in the timing of appointment bookings and interval between follow up examination to limit human to human contact. This is coupled with an increase in cleaning procedures, and the requirement of PPE. These changes have in turn affected the way sonographers perceive their jobs. Future surveys will aim to document whether these factors return to pre-COVID-19 levels. These results will aid advocating bodies to amend relevant policies in the future and will inform imaging departments for future planning.

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CONFLICT OF INTEREST

Jessie Childs is an editorial board member for Sonography and a co-author on this article. JC was blinded and not involved in the peer review process; management of the peer review process and decision-making for this article was undertaken by the Editor-in-Chief, Kerry Thoirs, acting as Handling Editor.

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