







ORIGINAL ARTICLE

Exploring the role of medical imaging assistants in Australian medical imaging departments: A mixed-methods study

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Abstract

Introduction: Allied health assistants are support staff who assist medical imaging professionals in their clinical and non-clinical role. Assistants can improve efficiency of medical imaging services; however, little is known about the specific tasks they perform. **Method:** A two-phase explanatory, sequential mixed-methods study design comprising a time motion survey and qualitative interviews was conducted across three health services in Victoria, Australia. Participants were medical imaging assistants supporting medical imaging professionals. Participants recorded tasks completed on a time motion proforma across two working days. Time spent on tasks was categorised into patient related and non-patient related tasks. Semi-structured interviews were conducted to explore assistants' perspectives about tasks, their roles and any responsibilities. Time motion data was descriptively analysed. Qualitative data were audiotaped, transcribed verbatim and analysed using the framework analysis method. Quantitative and qualitative findings were integrated using data triangulation. **Results:** Four medical imaging assistants participated, providing 4170 min of time motion data and 138 min of interview data. Integration of time motion and interview data revealed the medical imaging assistant role is predominantly non-patient facing; autonomous and critical to workflow; diverse and requires flexibility; has the potential to expand into a more patient-facing role. **Conclusions:** Medical imaging assistants make significant contributions to workflow management. Their role is predominantly non-patient facing but there appear opportunities for the clinical role to expand. Realizing these opportunities will require careful consideration of the challenges and benefits of extending their scope of practice.

Introduction

Demand for Australian medical imaging services is growing by a rate of approximately 5% per annum.¹ This increase in service demand, combined with chronic health workforce shortages is a major threat to the sustainability of medical imaging services and healthcare systems.² The allied health assistant workforce is proposed as a possible solution to workforce shortages.³ Allied health assistants are support staff who perform clinical and non-clinical tasks under the supervision and delegation of allied health professionals.⁴ Clinical tasks include direct patient interaction during provision of care (e.g., patient preparation, education) with the exception of assessment and diagnostic tasks. Both assessment and diagnostic tasks are generally considered outside their scope of practice.^{3,5} Non-clinical tasks do not involve patient contact but may support patient care.^{6,7}

Delegation of clinical tasks to allied health assistants improves both patient and organizational outcomes.⁷⁻⁹ For example, dietitians delegating the provision of advice on nutrition to allied health assistants can reduce mortality risks for patients who have undergone surgery for hip fracture.¹⁰ Similarly, pharmacists delegating medication order verification and ward-based education to assistants can reduce medication errors and healthcare costs.^{9,11} Therefore, with appropriate delegation frameworks, allied health assistants can perform clinical tasks that enhance the effectiveness of allied health care.¹²

While the allied health assistant role is limited to tasks that do not involve assessment, little is known about the specific tasks that medical imaging assistants perform within this scope, particularly in the Australian context. In the United Kingdom, clinical support workers perform basic administrative duties and clinical duties such as processing images, ordering stocks of consumable items and preparing patients for imaging.¹³ Support workers can also upskill to qualify as an assistant practitioner who can perform protocol-limited clinical tasks such as plain film radiography of the appendicular skeleton, axial skeleton, chest and abdomen/pelvis in adults.¹⁴ Similarly, in the United States of America X-ray technicians can perform specific examinations.¹⁵ These roles are site-specific, varying between sites and states due to health service requirements and assistants' training and skillset.¹⁵ In Australia, one study found that assistants improved efficiency with faster examination times, higher patient throughput and reduced workforce costs.¹⁶ This study did not describe the role or tasks that assistants performed, which makes it difficult to

implement similar roles in like healthcare settings. While there are opportunities for medical imaging to benefit from the medical imaging assistant workforce, greater clarity on these roles is required for this workforce to be utilised optimally.

Therefore, this mixed-methods study aimed to determine:

1. The tasks medical imaging assistants perform in clinical settings.
2. The proportion of medical imaging assistants' working day performing clinical (patient related) or non-clinical (administrative) tasks.
3. The medical imaging assistants' perspectives on their roles, responsibilities and contribution to the imaging team.

Methods

This research used a two-phase explanatory, sequential mixed-methods study design comprising a time motion survey and qualitative interviews across four medical imaging departments in three publicly funded health services in Victoria, Australia, from February to July 2021. In Phase 1, a time-motion survey was used to capture tasks performed by medical imaging assistants and quantify time spent performing tasks.¹⁷ In Phase 2, semi-structured interviews were conducted to further understand medical imaging assistants' roles and tasks by exploring perspectives of the tasks they perform, their roles and responsibilities. Both quantitative and qualitative data were collected to ensure a comprehensive account of tasks and the contribution these roles added to the health service.¹⁸ This study was approved by each local health service's Human Research Ethics Committee (RES-20-0000118L) and reported using the Good Reporting of A Mixed Methods Study (GRAMMS) guidelines.¹⁹

Participants

Participants were medical imaging assistants ($n = 4$) working across three independent healthcare organizations (metropolitan $n = 2$ and regional $n = 1$) in medical imaging including computed tomography (CT), general X-ray, ultrasound and magnetic resonance imaging (MRI) departments. Participants were invited via email and at departmental meetings. Medical imaging assistants who expressed interest in participating were then contacted by a researcher who provided further information about the study. All participants provided written informed consent prior to data collection.

Time motion data

Participants recorded tasks they performed using pre-determined activity codes (Data S1). Activity codes were developed using data from allied health assistant focus groups who worked with the allied health therapy professions.^{5,20} The activity codes were tailored to medical imaging assistants by a researcher in medical imaging (JP), with reference to assistants' role descriptions and in collaboration with two senior radiographers with content expertise. A proforma was developed to record these codes (Data S2) and was piloted with a registered radiographer to ensure that codes reflected tasks that may be delegated by a radiographer and could be recorded in a systematic way.

Participants then completed the time motion proformas over a minimum of two full working days with activity recorded in 10-min blocks. Participants recorded activities over two separate days of the week (e.g., Tuesday and Thursday). Where more than one task was reported in a 10-min block, time was averaged across the number of tasks undertaken. Participants were encouraged to document any task that did not fit within the pre-established codes. In addition to documenting the task performed, participants were required to indicate the clinical stream in which the task was performed, and the mode of communication if the task involved communication. For the communication variable, data were also collected on who (e.g., staff, patient) the assistant communicated with.

The proforma enables tasks to be classified into six categories: clinical reporting or handover; clinical management; equipment or environment; administration; transition; and waiting. A description of each category is provided in Table 1.

Time spent on tasks was the primary outcome measure which was categorised into patient-related and non-patient-related tasks. Patient-related tasks included any activity involving patient management. Non-patient-related tasks included those not involving patient management. Patient

tasks were further categorised into the direct patient (patient is directly involved in the task, e.g., escorted from the ward), or indirect patient tasks (patient not directly involved, but task impacts care, e.g., sourcing blood test results for patient preparation). Figure 1 outlines the data collection structure and variables.

Participant Interviews (Phase 2)

An interview guide was used to ensure significant points of interest were consistently addressed during semi-structured interviews (Data S3). The interview guide was developed in parallel with the time motion data collection tools, to facilitate a deeper exploration and understanding of the quantitative data recorded by participants. Specifically, the interviews were conducted with a view to explore participants' perspectives on the tasks they undertake, role autonomy in medical imaging, their perceptions of the proportion of time spent undertaking the activities described, and how the role is operationalised. The guide was used in a concurrent study investigating the roles of allied health assistants in the allied health therapy professions. Interviews were conducted by two researchers (JP and OK) who did not directly supervise or work with the participants.

Data analysis

Time motion data were analysed descriptively using SPSS Statistics software (Version 28). Time spent on tasks was reported as total time (minutes) and proportion of time (%) spent on tasks.

Qualitative data were audiotaped, then transcribed verbatim and thematically analysed using the framework analysis method.²¹ Two authors (OK and JP) inductively coded the data, and agreed upon the analytical framework, grouping the derived codes into categories. One author (OK) used the framework to code the data via NVivo™ to support frequency and concept analysis.

Table 1. Task category with description and examples.

| Task category | Description | Example of task |
|--------------------------------|---|--|
| Clinical reporting or handover | Tasks pertaining to any communication about a patient | Advising staff of patient's required preparation |
| Clinical management | Tasks pertaining to direct patient interactions affecting patient management | Facilitating completion of contrast forms |
| Equipment or environment | Tasks pertaining to departmental equipment, clinical environment requirements or providing radiographer support | Cleaning and/or maintenance of equipment, accessing/removing additional equipment for positioning or the environment |
| Administration | Any non-clinical administration task | Scheduling bookings |
| Transition | Tasks pertaining to moving a patient from one place to another | Escort/Transport patient to the ward |
| Waiting | A pause interval or delay between activities | Waiting for the nursing escort |

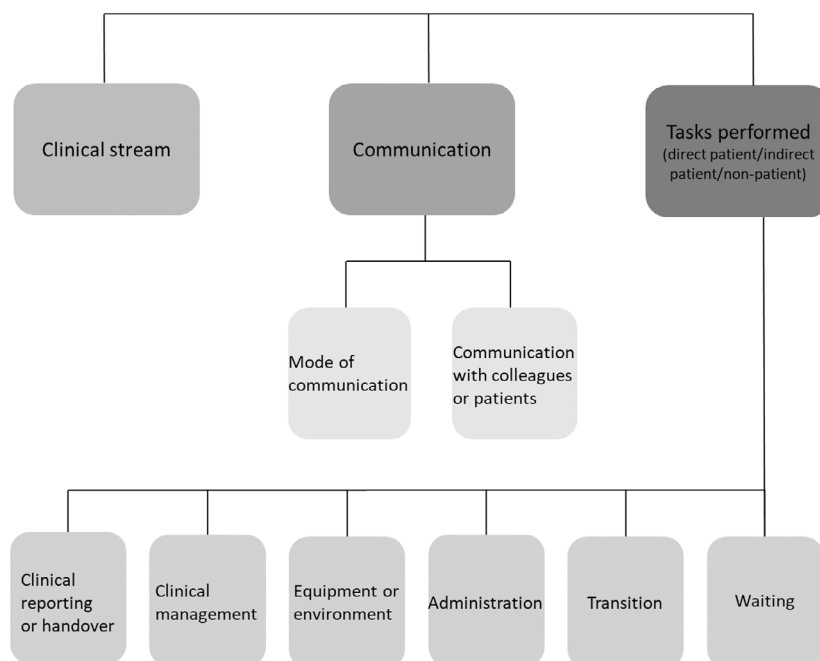


Figure 1. Data collection structure and variables.

The thematic analysis approach was used to explore medical imaging assistants' perspectives of their role and to better understand their contribution to workflow and value to the health service.

In the concluding analysis phase, corroboration was sought between the quantitative and qualitative findings using data triangulation. Interpretations were summarised in a table, outlining how the two forms of data were referenced to the study aims, both individually and collectively.¹⁸

Results

Participants

Of the 20 medical imaging assistants at the health services, four consented and participated. Participants' years of experience ranged from less than 1 year to 8 years (median 4.4 years).

Time motion data

Time motion data collected was 4170 min across nine working days (one participant provided three days of data). The median working day was 430 min (range: 430–520 min). Eighty minutes (2%) of data were missing.

Time spent on tasks

Medical imaging assistants spent more time on non-patient related tasks (2461 min, 59%) than on patient

related tasks (1629 min, 39%). Medical imaging assistants spent more time performing direct patient related tasks (970 min, 23%) than indirect patient related tasks (659 min, 16%).

Medical imaging assistants spent most of the time performing administration tasks (1266 min, 30%), and the least amount of time on clinical management (369 min, 9%) (Table 2).

Participants identified 23 individual tasks, 17 (74%) of which they spent less than 5% of their daily working time executing each task. The most common non-patient tasks were managing the booking schedule (670 min, 16%), moving equipment, (422 min, 10%), and organizing appointments (307 min, 7%). The most common patient-related tasks performed were facilitating patient preparation (369 min, 9%), transferring patients (307 min, 7%), and cleaning equipment and managing infection control (220 min, 5%) (Table 3).

Clinical Stream

Participants spent most of their time in computed tomography (CT) (2873 min, 69%), and less time in X-ray (678 min, 16%), ultrasound (602 min, 14%) or magnetic resonance imaging (15 min, <1%).

Communication

Most of the reported communication was face-to-face (1845 min, 44%) (Table 4). Participants most frequently

Table 2. Proportion of time spent on patient related and non-patient-related tasks.

| Task categories | Minutes | % |
|--------------------------------|---------|-----|
| Patient | 1629 | 39 |
| Direct patient | 970 | 23 |
| Transition | 601 | 14 |
| Clinical management | 369 | 9 |
| Indirect patient | 659 | 16 |
| Clinical reporting or handover | 659 | 16 |
| Non-patient | 2461 | 59 |
| Administration | 1266 | 30 |
| Equipment or environment | 1078 | 26 |
| Waiting | 117 | 3 |
| Missing or incomplete data | 80 | 2 |
| Total | 4170 | 100 |

communicated with medical imaging technologists (928 min, 22% of the documented communication).

Participant interviews

Interview duration ranged from 20 to 49 min (total data 138 min). Three major themes were identified: (1) tasks are important to workflow; (2) tasks are predominantly non-patient facing and (3) the role has evolved over time.

Theme 1: Tasks are important to workflow

Medical imaging assistants described performing tasks allowing radiographers to focus on more complex tasks, such as organising imaging protocols, contrast administration, and post-imaging processing and reconstruction. Benefits to radiographers, administrative staff, and the health service are evident in the diversity of tasks they perform, and ability to do so concurrently. They assume additional tasks within their scope to improve workplace efficiency.

I'm there to facilitate the radiographers ... making sure the next patient is ready to scan so there are no delays... I need to make sure I'm on top of the workflow. Not just the next patient or the patient after that, four or five patients ahead.

– Participant 1

Medical imaging assistants described trying to mitigate workflow delays by organizing appropriate resources in a timely manner:

In X-ray it's more managing patient flow...but in CT for me, it's more prepping the room for the next patient

– Participant 3

Table 3. Proportion of time spent on activity tasks.

| Individual tasks | Minutes | % |
|--|---------|----|
| Patient | | |
| Direct patient | | |
| <i>Transition</i> | 601 | 14 |
| Transfer patient (bed or WC) | 280 | 7 |
| Transporting/escorting patient (walk/WC/bed) | 179 | 4 |
| Assist in patient positioning | 142 | 3 |
| <i>Clinical management</i> | 369 | 9 |
| Facilitate patient preparation | 369 | 9 |
| Indirect patient | | |
| <i>Clinical reporting or handover</i> | 659 | 16 |
| Advising ward staff patient prep | 216 | 5 |
| Reading notes (prep for patient) | 126 | 3 |
| Source test results (e.g., blood) | 123 | 3 |
| Documentation in progress notes | 110 | 3 |
| RIS data entry/register requests | 84 | 2 |
| Non-patient | | |
| <i>Equipment or environment</i> | 1078 | 26 |
| Moving equipment | 422 | 10 |
| Clean equipment/infection control/rubbish | 220 | 5 |
| Preparing area for use | 186 | 4 |
| Restocking (linen/consumables) | 168 | 4 |
| Supplies/equipment ordering for department | 55 | 1 |
| Clean up spills | 27 | 1 |
| <i>Administration</i> | 1266 | 30 |
| Manage booking schedule | 670 | 16 |
| Timetabling/organizing OP/IP appointments | 307 | 7 |
| Handle enquiries from staff | 99 | 2 |
| Wait list management | 77 | 2 |
| Photocopying/printing/scanning | 71 | 2 |
| Image transfer (PACS*)/burn CD | 31 | 1 |
| Statistics | 8 | <1 |
| Staff meeting | 3 | <1 |
| <i>Waiting</i> | 117 | 3 |
| Waiting | 117 | 3 |
| <i>Missing or incomplete data</i> | 80 | 2 |

Abbreviations: CD, Compact Disc; IP, Inpatient; PACS, Picture Archiving Communication System; OP, Outpatient; RIS, Radiology Information System; WC, Wheelchair.

Medical imaging assistants identified making a positive contribution by improving workflow through demonstrating teamwork, initiative, assuming responsibility and completion of tasks.

I don't like to stand around and do nothing. I've always got to be doing something. I tend to do just a little bit extra. If it makes things run smoothly and helps out

– Participant 2

Medical imaging assistants reported the importance of communication skills and liaising with other health service personnel:

Table 4. List of communication modes used and intercommunication with colleagues and patients.

| Variables | Minutes | % |
|---|---------|-----|
| Mode of Communication | | |
| Face to face | 1845 | 44 |
| Phone | 846 | 20 |
| Communication book | 148 | 4 |
| Electronic (EMR, Email) | 135 | 3 |
| No communication | 1116 | 27 |
| Missing or incomplete data | 80 | 2 |
| Total | 4170 | 100 |
| Communication with colleagues/patients | | |
| Medical imaging professional | 928 | 22 |
| Patient | 858 | 21 |
| Ward staff | 657 | 16 |
| Nurse | 252 | 6 |
| Other colleague (e.g., doctor) | 225 | 5 |
| No communication | 1170 | 28 |
| Missing or incomplete data | 80 | 2 |
| Total | 4170 | 100 |

Abbreviation: EMR, Electronic Medical Record.

If I have any doubts at all, I go straight to the radiographer in charge. I just ask them, 'Hey, I need help on this',

– Participant 1

This demonstrates the relationship strength, open communication and trust between the medical imaging assistant and radiographers, a positive work environment and consistent workflow.

Theme 2: Tasks are predominantly non-patient facing

Medical imaging assistants outlined spending much of their time managing booking schedules, handling enquiries, cleaning and preparing clinical areas.

I would say at 80/85% of my job is cleaning and restocking... after a patient is gone, just getting rid of the sheets and then wiping it down, just wiping the whole CT scanner and table down and putting fresh sheets on.

– Participant 3

Participants described frequently performing several tasks simultaneously.

We ring the wards, get the patients prepping, fasting or whatever they need to do for their scans, organise if we need nurses, type of transport, and liaise with the PSAs (patient services attendants) to bring them over.

– Participant 4

Although medical imaging assistants described their role as primarily non-patient facing, they also highlighted examples where they take opportunities to contribute to patient care by providing reassurance and means of comfort.

Just reassuring the patient, there's a lot who haven't had a CT scan before. They might be a bit nervous. So, it's providing reassurance, showing compassion and being empathetic ... Sometimes just a warm blanket if they're cold.

– Participant 1

Theme 3. The role has evolved over time

Medical imaging assistants who had been working in the area for some time described how their role had changed. This was influenced by recognition of competency by the radiographers, adapting with the needs of the staff, department and healthcare service.

At the start when I first started this job, it basically was to just answer the phone and just to take messages, clean the room.

– Participant 1

Through extensive practice and experience, medical imaging assistants discussed how they acquired specialised knowledge:

I might go to ED, check their heart rate because their heart rate's got to be below 60 to do the cardiac scan, they've got a cannula in the cubital fossa, not in their hand... It's not just picking up and bringing a patient. There's a lot more involved.

– Participant 2

Medical imaging assistants reported planning and prioritizing their work according to departmental needs. They gained fulfilment through skill development and identified specific clinical tasks they could adopt as part of their expanded practice:

I'd love to be able to do cannulation. That would save so much more time and free up the nurses. It would be so much quicker to get through the scans.

– Participant 2

Integrated findings

Through the integration of time motion and interview data, it was identified that the medical imaging assistant

Table 5. Integrated analysis: Triangulation of quantitative and qualitative findings.

| Integrated findings | Quantitative finding | Qualitative finding |
|--|--|---|
| Medical imaging assistants' role is predominantly non-patient facing. | Medical imaging assistants spend more time on non-patient related tasks (2461 min, 59%) than on patient-related tasks (1629 min, 39%). | Tasks are predominantly non-patient facing, and are administrative, equipment or environment focused. For example, organising bookings, preparing the clinical area and providing radiographer support. |
| Medical imaging assistants' role is autonomous and critical to workflow, in particular patient flow. | Most common non-patient tasks were managing booking schedule (670 min, 16%), moving equipment (422 min, 10%) and timetabling/organizing inpatient/outpatient appointments (307 min, 7%). | Tasks are important to workflow and are often invisible. For example, their unwavering attention to minimising delays, and ensuring that resources required for each patient encounter are prepared and accessible. |
| Medical imaging assistants' role is diverse and requires flexibility. | Participants identified 23 different tasks, 17 (74%) of which they spent less than 5% of their day executing. | Tasks are many, varied and often performed simultaneously, reflecting the environment, imaging modality, the imaging assistants' level of experience, and relationships with the delegating radiographers. |
| Medical imaging assistants' role has the potential to expand into a more patient-facing role. | Demonstrated ability to perform fundamental patient related tasks such as facilitating patient preparation. | The role has evolved over time. Medical imaging assistants identify opportunities to expand their role and adopt more responsibility for direct patient-facing tasks. |

role is predominantly non-patient facing; is autonomous and critical to workflow; is diverse and requires flexibility; and has the potential to expand into a more patient-facing role (Table 5).

Discussion

To the authors' knowledge, this is the first study describing tasks performed by Australian medical imaging assistants. Medical imaging assistants are flexible, engaged and make a significant contribution to workflow management, predominantly performing non-patient facing and administrative tasks. However, we also found that there are opportunities for role advancement, particularly in undertaking greater responsibility for patient facing tasks.

Medical imaging assistants make a significant contribution to Australian medical imaging departments by improving efficiencies and reducing costs, while working within their current scope of practice.¹⁶ This current study improves our understanding of how the assistant workforce enhances efficiency by improving workflow in medical imaging departments and provides a rigorous process that medical imaging departments can use to better understand the contribution of their assistant workforce. While medical imaging assistants play

an important indirect role in meeting the current demand for services, their role may need to expand to a more direct, patient-facing role to meet the projected increase in demand for services.^{1,2}

This study demonstrated the potential for a broader scope for the medical imaging assistant. Medical imaging assistants in other countries perform similar tasks to the assistants in the current study,^{13,15} however, these countries have expanded roles to perform imaging tasks under supervision of registered practitioners.^{14,15,22} Assistants in the current study demonstrated the capacity to contribute to patient care and provided examples where this aspect of their role could be expanded. In some Australian states, nurse practitioners and medical professionals (i.e., general practitioners) perform imaging tasks to meet the current demand for services in rural areas.²³ However, this limited service is not typically provided in metropolitan areas and is not uniform across all of rural Australia. This highlights opportunities for Australian medical imaging assistants, with appropriate training and education, to perform more patient-facing tasks and assist with the demand for services. However, the challenges and benefits of implementing these advanced roles (i.e., assistant practitioner) need to be considered.

The potential benefits of assistant practitioners include freeing up time for radiographers to complete more

specialist tasks, and lower costs per examination (i.e., cost benefits).^{24,25} While these benefits may be appealing to Australian medical imaging departments, some United Kingdom radiography departments refute these benefits, citing assistant practitioners' limited scope of practice and the need for radiographers to perform the majority of examinations, authorise initial examinations, sign off on images and inform patients of outcomes.^{14,24} Given these restrictions to the scope of practice, medical imaging departments must appropriately plan and implement processes to ensure efficiency in delegation of tasks. In the absence of planning and careful implementation, it is unlikely that benefits will be realised.²⁴

Another consideration is the blurring of the boundary between an assistant practitioner's and a radiographer's scope of practice.²² This role blurring may occur when assistant practitioners extend their scope of practice in response to service pressures (e.g., high workloads and staff shortages).^{22,26} In these cases, assistant practitioners may perform tasks such as oral contrast administration, X-rays remotely from the imaging department, and imaging in children without direct supervision of radiographers.^{14,22,26,27} Although supervision can be time-consuming and a significant shift in radiographers' role, it is critical for ensuring patient safety.^{24,27,28} Therefore, medical imaging departments need to implement appropriate supervision frameworks to ensure that assistant practitioners are both safe and effective.²⁹

For the assistant workforce to undertake a more advanced clinical role, appropriate training is required. In the United Kingdom, there is no universal qualification for assistant practitioners; both formal and work-based programs (i.e., apprenticeships) are accepted.¹⁴ Many assistant practitioners believe that standardised training could better prepare them for their advanced clinical role.³⁰ However, even with standardised training, work-based training may be required after qualification, as demonstrated in the Australian allied health assistant workforce where the therapy professions report insufficient vocational training and a need for on-the-job training.³¹ These additional time and resource commitments must be accommodated by medical imaging departments to see the advancement of assistants' clinical roles.

The results of our study need to be interpreted with respect to the limitations of the study design. Self-reporting can be unreliable and may overestimate productive work time compared with independent observation. While continuous observation is considered the gold standard for time motion studies, due to COVID-19 restrictions in healthcare, the use of independent observers for this study was not possible.¹⁷ COVID-19 restrictions in healthcare may have also

impacted on medical imaging assistants' role in some direct patient tasks. While we cannot quantify the impact of COVID-19 restrictions on our findings, they should be interpreted within this context. The number of participants was small, and data were collected from three independent health services with participants having varying levels of experience. This sampling approach increased the likelihood of capturing a diversity of roles across organisations²² but also limited our depth of understanding of the role within any one type of health setting or level of experience and therefore, additionally limited the transferability of the findings.³² Nonetheless, through the qualitative analysis, we identified themes common to each participant, setting and level of experience. We also collected both quantitative and qualitative data, allowing us to have a more comprehensive account of the medical imaging assistant role.¹⁸ A larger study, using the proforma developed and external observation, is required to further understand the role of medical imaging assistants in Australian medical imaging departments; additional research could compare the role of assistants working in metropolitan and regional settings, and examine tasks performed by medical imaging students working in assistant roles.

Conclusion

Medical imaging assistants are flexible, engaged and have the potential to make significant contributions to workflow management. Their role is predominantly non-patient facing however, there are opportunities to expand their clinical role. Realizing these opportunities requires careful consideration and a strategic approach to the development of systems that ensure safe care through appropriate education, delegation and the supervision of clinical tasks.

Author Contribution

DAS, OAK, AMD and JAP conceptualised the study. All authors contributed to protocol development. JAP, DAS, OAK and AMD collected data. JAP, DAS and OAK analysed data. JAP, DAS and OAK drafted the paper. All the authors provided critical review and approved the study for submission.

Ethics Approval

Ethics approval (multi-site) for this project was obtained from the Monash Health Human Research Ethics Committee (Approval no. RES-20-0000118 L). All the participants provided written informed consent prior to commencement of the study.

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Conflict of Interest

The authors declare that there is no conflict of interest.

Data Availability Statement

Data are not available as participants did not consent for raw data to be shared.

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Supporting Information

Additional supporting information may be found online in the Supporting Information section at the end of the article.

Data S1. Activity data codes.

Data S2. Time motion proforma.

Data S3. Interview guide: semi-structured interviews.