Strategies, challenges and enabling factors when imaging autistic individuals in Swiss Medical Imaging Departments

Introduction

Autism is neither a pathology nor a disease; it is part of neurodiversity and has to do with how the brain is wired. It is thought that this different wiring occurs during the early development of the brain resulting from both genetic and environmental conditions [1,2]. It is more often diagnosed in early childhood although many autistic people receive their diagnosis much later, in adulthood and some, unfortunately never receive a diagnosis [2,3]. Although not all autistic individuals are the same but rather cover a spectrum, autistic individuals overall may present different characteristics compared to a neurotypical person, such as finding social interactions more challenging, may have difficulties in communication and some can be non-verbal and might have sensory sensitivities [1,2]. Modifications on their daily life routines may provoke high levels of anxiety, therefore they tend to be more comfortable to stick to their "rituals". They may be more sensitive to different types of sensory stimulation such as lights, noises, colours, textures and food but there have been reports that they might experience physical pain differently and some might have a higher pain threshold and being more resilient in temperature variations (warm and cold) [2,4,5]. All stimming, repetitive movements, noises produced by them, seeking specific textures, have a comforting effect and are necessary for them to self-regulate [4,6].

Autistic patients need access to healthcare provisions like neurotypical people do. They may have a higher prevalence of different comorbid conditions including epilepsy, and digestive disorders, and might be more likely to self-harm or even to be victims of violence and crime, which demands sometimes emergency healthcare [7–13]. Autistic patients may also need medical imaging for common clinical concerns and need magnetic resonance imaging (MRI), for specific comorbidities such as epilepsy. MRI plays also a very important role for brain evaluation during research studies and sometimes it is used in the diagnostic follow up after an autism diagnosis [14–16].

Autistic patients may face several challenges when trying to access healthcare, like poor coordination between services or healthcare professionals (HCPs) and lack of adequate HCPs training to enable them to adapt radiography practice to their patients' needs [17–21]. Healthcare environments, with the multiple sensory stimuli, crowded waiting areas, increased lighting and noise, act as barriers to accessible healthcare service [17,22]. The medical imaging departments (MIDs) different hardware, often intense lights, loud noises, crowded spaces can easily overwhelm the autistic patients. The necessary procedures to perform the examinations, especially patient positioning, staying still and intravenous line placement can generate a varying degree of discomfort or distress [23]. The sensory stimuli and often the absence prior preparation may result in anxiety, hyperactivity, autistic meltdown or self-injury. In addition, a negative experience lived by the autistic patient can impact future examinations and treatments, often expressed as lack of trust and fear towards the HCPs [1,17,19,24,25]. Depending on the levels of anxiety and after a thorough risk assessment, sometimes

the proposed solution is sedation or anaesthesia, despite well-known rare side effects, in order to calm the patient down, reduce motion artefacts which can turn images non-diagnostic, in order to complete the scan and offer the patient much needed diagnosis and treatment [26,27].

Previous work offers some examples on how to manage autistic children during MRI and help optimise patient experience [28–34]. Methods to manage autistic adults in the other imaging modalities are scarce [21,23,35], There are no known published national guidelines on the management of autistic patients in Radiology/Medical Imaging and none specifically in the Swiss context [2,33,34,36,37].

This study aims to explore and understand the strategies used by radiographers to image autistic patients in Swiss MIDs, highlight enablers and challenges and offer some respective recommendations, adapted to the Swiss service provision.

Methodology

An exploratory research design was chosen as optimal for a topic that is rather novel. A mixed methods research methodology was applied, for triangulation of qualitative and quantitative data [38].

Ethics

Ethics approval was obtained from the Swiss Ethics commission of XXXX to perform the study under the reference number: REQ-2019-01148. Data was anonymised, no personal details of the survey's participants were collected, and the interview participants were associated with a unique identification number. Consent was obtained before data collection from each participant through a dedicated "consent button" in the survey. For the interviews, the participants were informed through a participant information sheet and had to return a signed informed consent form. The interviewed were also informed they could withdraw at any time without this affecting their work, career progression or promotion. Furthermore, the transcription was only accessible to the study author and directors. The original recordings were safely discarded after the transcription. Data from the survey was recorded and secured in the XXXX servers in Switzerland. The participants from the survey could contact by email the main author if any questions or issues were raised.

Participants

Radiographers working in Switzerland MIDs, regardless of whether they had managed or not an autistic patient, were invited to participate in this study. All different healthcare settings (hospitals, clinics, university hospital) were included. Incomplete responses were excluded as invalid.

The survey was distributed nationwide via a web link through a national newsletter of Swiss Radiographers Society (ASTRM). Also, an e-mail was sent to the Chief radiographers of the French-speaking part of Switzerland requesting their help to share the survey widely within their teams as well as to kindly send a reminder e-mail after 4 weeks. The survey was online between the 17th of June and the 3rd of September 2020.

The participants for the interviews were selected from the online survey (n=5). The survey ended with a question addressed to French-speaking radiographers who managed an autistic patient to identify if any was available and willing to participate in the interview. The interviews were conducted between the 11th February and the 1st March 2021.

Online survey

The survey was used as it can quickly reach a larger population and it is inexpensive [38]. The survey was originally co-constructed in English by autistic experts from the National Autism Society, a group of autistic service users and by a team of UK radiography experts [39] ; it was based on published UK literature and further adapted to the Swiss context and translated into French. The scope was also expanded to the whole of medical imaging. Three volunteer radiographers piloted the survey, and specific suggestions on content and format as well as language were integrated when relevant. The survey was designed and distributed via the software RedCap® [40] and translated in French and English to cover different radiographers working in Switzerland. The participants were able to select whether they wanted to answer in French or in English.

The survey was consisting of three sections, including closed-type questions (dichotomous and multiple-choice one) and one open-ended questions allowing the participants to add a comment. The three sections were: 1) participant's demographics and hospital characteristics, with questions regarding the type of hospital, the role/main activity of the participant and the modalities of expertise (multiple-choice), the years of expertise and the gender; 2) Clinical practice and management when imaging autistic patients: radiographer experience managing ASD patients, context (multiple-choice), communication strategy (multiple-choice), enablers and facilitators (multiple-choice) and changes/adaptations performed during or after the examination (multiple-choice); 3) Training and knowledge about autism. The participants were also asked if they had received any training about the management of autistic persons during their education at school or as continuous professional development already as professionals. To understand radiographers' training needs, the participants were asked about the type of training required to manage autistic patients (multiple-choice). A question about the existence of a local protocol was asked to know if specific guidance was in place, and participants could load the local protocols, if they were available.

Interviews

The interview guide was based on the survey results and previous studies about autism [17,41,42] by using the operationalisation method from Quivy & Campenhoudt [43] and the dimensions: experience, formation/training and institution (Table 1). The interviews were semi-structured to facilitate the participant to speak more freely[1] and an audio-visual platform (Microsoft Teams) was chosen instead of face to face due to Covid-19 context requirements. The interviews were designed to last a maximum of thirty minutes, were conducted in French and they were recorded and later transcribed. Two volunteer radiographers tested the guide in the same conditions of the real interviews,

[1] Personal communication in 2020 with Ms Seferdjeli, Professor at HES-SO

and suggestions were integrated when relevant. The verbatims presented in this study were translated from French to English by two people.

Table 1. Operationalisation of interviews and interview schedule

Concept	Dimensions	Components	Indicators
The experience of caring an autistic patient	Formation/ Training	Interaction/ communication Patient/Carer	What is your opinion on the possibility of doing training on autism?
		Knowledge about autism	How has the autism training helped you to manage these patients in MIDs?
	Experience	Examination/ Collaboration patient and carer	Could you talk about your experience of managing the autistic patient in MIDs?
			Could you talk about the more difficult times you experienced when managing autistic patients?
			If you encountered difficulties, how did the training help you to overcome the difficulties?
			Have your perceptions of an autistic patient changed between before and after the examination?
		Cooperation Carer	How important do you perceive is the collaboration of carers during the examination?
	Institution	Scheduling report autistic patient	How does the pathway of communication work in your institution in relation to an autistic patient?
		Adequate time	Did you have enough time with the patient and the carers?

Data analysis

Descriptive statistics was used for data analysis using Stata 2014 for Windows and Excel 2016. The interviews were analysed, according to Bardin [44], in two phases; first a thematic analysis corresponding to the individual codes and the second phase corresponded to the emerging themes.

Results

A hundred and twelve questionnaires were received, but twelve had to be excluded as incomplete. The response rate was approximately 3% based on an estimated population of radiographers of three thousand eighty-four in 2011 [45]. From the survey, ten French speaking radiographers answered positively for an interview, six were selected based on diverse demographics and limited resources and time, three females and three males. Finally, five accepted to participate and were interviewed. The interviews participants were numbered from one to five, the corresponding number were added at each declaration of the participant. Some of the statistics may not add up to 100% if the respondents could choose more than one options in one question; this is noted below, where applicable.

Demographics

Most of the participants were radiographer practitioners (89%) and female (62%). A smaller group was responsible for managing a department (superintendent) (19%) and 10% were radiation protection experts (multiple-choice questions). Most of the participants were working in conventional radiography (82%), CT-scanner (65%), MRI (56%) and in special examinations (51%) (multiple-choice). Radiographers working in nuclear medicine (12%) and radiation therapy (3%) were also identified (multiple-choice) (Table 2).

Table 2. Characteristics of the participants from the survey (n=100).

Characteristics of the participants		N	%
Gender	Female	62	(62%)
	Male	38	(38%)
Language selection	French	90	(90%)
	English	10	(10%)
Management of autistic people	Yes	60	(60%)
	No	27	(27%)
	I don't know	13	(13%)
Years of experiences	0 – 5 years	24	(24%)
	6 – 10 years	18	(18%)
	11 – 15 years	18	(18%)
	16 – 20 years	10	(10%)
	21 + years	30	(30%)
Modality of expertise (multiple choice)	X-ray	82	(82%)
	CT	65	(65%)
	MRI	56	(56%)
	Mammography (Mammo)	30	(30%)
	Special examination (SE) (e.g. digestives, urinary)	51	(51%)
	Interventional Radiology (IR)	34	(34%)
	Ultrasound (US)	23	(23%)
	Nuclear Medicine (NM)	12	(12%)
	Radio-oncology (RO)	3	(3%)
Other expertise	Cardiac catheter examination, management, regulator, pic line, Tarmed, photo biomodulation, RIS/PACS.	7	(7%)
Role in the institution (multiple choice)	Radiographer practitioner	89	(89%)
	Academic	0	(0%)
	Research	4	(4%)
	Manager	4	(4%)
	Educator	5	(5%)
	Modality Superintendent	19	(19%)
	Radiation protection expert	10	10%)
	Chief radiographers	5	(5%)
Other roles	Screening expert, member of the Academic Council, quality manager, patient safety manager, hospital hygiene referent.	5	(5%)

Management of autistic patients

Sixty participants (out of a hundred) reported having managed an autistic patient. Fifty were working in a public institution and ten in a private institution. Thirty-six were female and twenty-four were male. The way the radiographers interacted with an autistic patient was, for most of them, positioning/scan the patient for an imaging examination (96.7%) (multiple-choice). None of the participant radiographers had access to local guidelines for autism (Table 3).

Table 3. Ways radiographers have interacted with autistic patients

Ways radiographers have interacted with autistic patients	n	%
Positioned/scanned an autistic patient for imaging examinations	58	96.7%
Interacted with the carer(s) to prepare the autistic patient for the examination	30	50%
Other contexts	2	3.3%
Trained radiographers on imaging autistic patients	1	1.6%
Created local guidelines for autism	0	0%

For the interviewed radiographers, all had positioned/scanned autistic patients in X-ray, MRI or CT-scanner. The patients were paediatric, young adult or adult and one participant had taken part in an MRI study of paediatric autistic children.

(…) Then it's occasionally that we have some who are autistic, I would say that it's not often, but it happens. (…)" (4)

Strategies applied by radiographers

From the survey, most of the radiographers (91.7%) took more time to explain the examination to the patient and their carers or (81.7%) adjusting their communication to the patient (multiple-choice). A small percentage of radiographers (3.3%) did not change the examination procedure, and none tried to make the scan less noisy (multiple-choice) (Fig. 1).

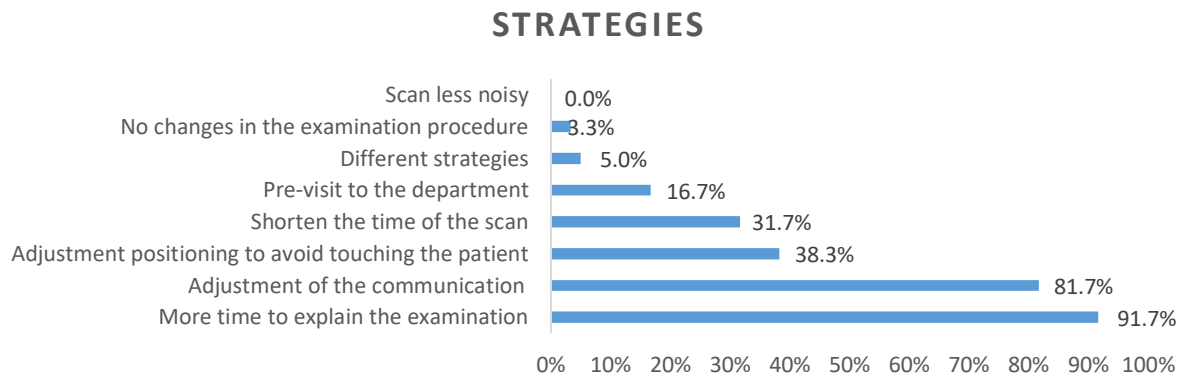

Figure 1. The strategies employed by the radiographers when imaging autistic patients

During the interviews, the participants also shared that they took more time with the patient and the carer to explain the examination. They highlighted that they adapted their behaviour to each patient. To paediatric patients, the participants shared they proposed to listen to music. In the interviews it was also referred that it was always important to thoroughly explain the procedures.

(…) every experience is different, in fact. (...) because it is very different from one person to another, so I try to adapt to the person or to the accompanying person if there is one (…)" (3)

Enabling factors

Most of the radiographers (81.6%) that have managed autistic patients found as the most helpful action to successfully perform the examination was the support obtained from the carer/accompanying person and/or the support from a colleague (36.6%) (multiple-choice) (Fig. 2).

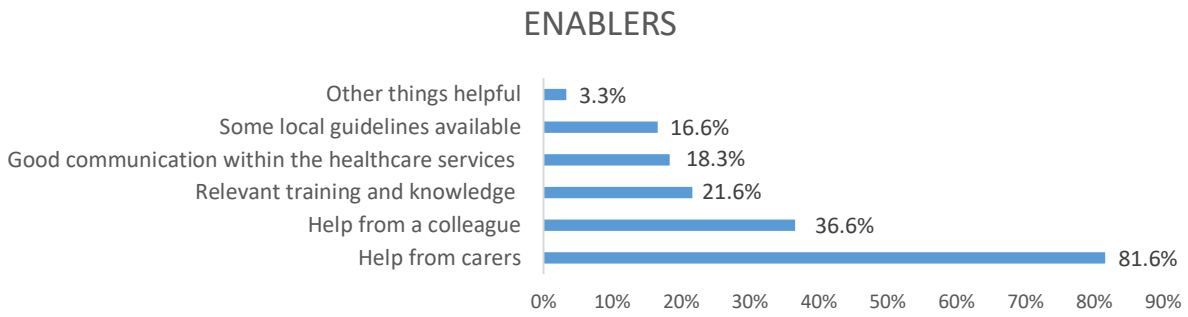

Figure 2. The enablers' factors experienced by the participants

As in the survey, the role of the carer/accompanying person was also highlighted during the interviews.

"(…) it's the carer that we're going to explain everything to and then they are going to help us set up actions to be able to perform the exam (…)" (1)

During the interviews, one of the participants reported that having a supportive colleague, with the necessary equipment and empathy that facilitates the interaction with the autistic patient could be useful, mainly when the carer cannot help the radiographer enough. Sharing the work between radiographers was also highlighted as a facilitator when interacting with the patient and the carer.

"(…). Instead, you need a nice colleague who does everything else, and (...) (4) "(…) I called my colleague (…) she was more at ease with the child than the mother. (…)" (1)

Communication enablers

Most of the radiographers (58.3%) were notified about the patient's condition by the carers/accompanying person, while 38.3% were notified by the institution via the examination request (multiple-choice). But 30% declared that the patient condition was not communicated before the examination by any other health professional or administrative staff, or by the carer/accompanying person (11.7%) (multiple-choice) (Table 4).

Table 4. Ways of communication about the patient's condition to the radiographers

Patient's condition ways of communication to the participant	n	%

By the carers/ accompanying person	35	58.3%
By the institution via the examination request	23	38.3%
Verbally by another health professional	18	30%
Verbally by an administrative staff	10	16.7%
Written on the patient daily list	7	11.7%
Coded in the patient daily list	2	3.3%
Not communicated before the examination by any other health professional or administrative staff	18	30%
Not communicated by the carer/accompanying person	7	11.7%

In the interviews, the participants highlighted that having the information before the examination (CT-scanner) helped on organising/planning the shift to have adequate time with the patient. In MRI, they reported that the procedure was well coordinated, they generally knew if the patient was autistic beforehand, and the patient would visit before the examination. They added that for paediatric patients, the referral had an important role in organising the examination with the MID, by informing if the patient needed a IV placement, sedation or anaesthesia.

"(…) there is one doctor (...) when she addresses them (...) she tells us under hypnosis please (…)" (3)

Figure 3 presents the emerging themes and subthemes related to the enablers of communication showing the different factors that impacted medical imaging examinations.

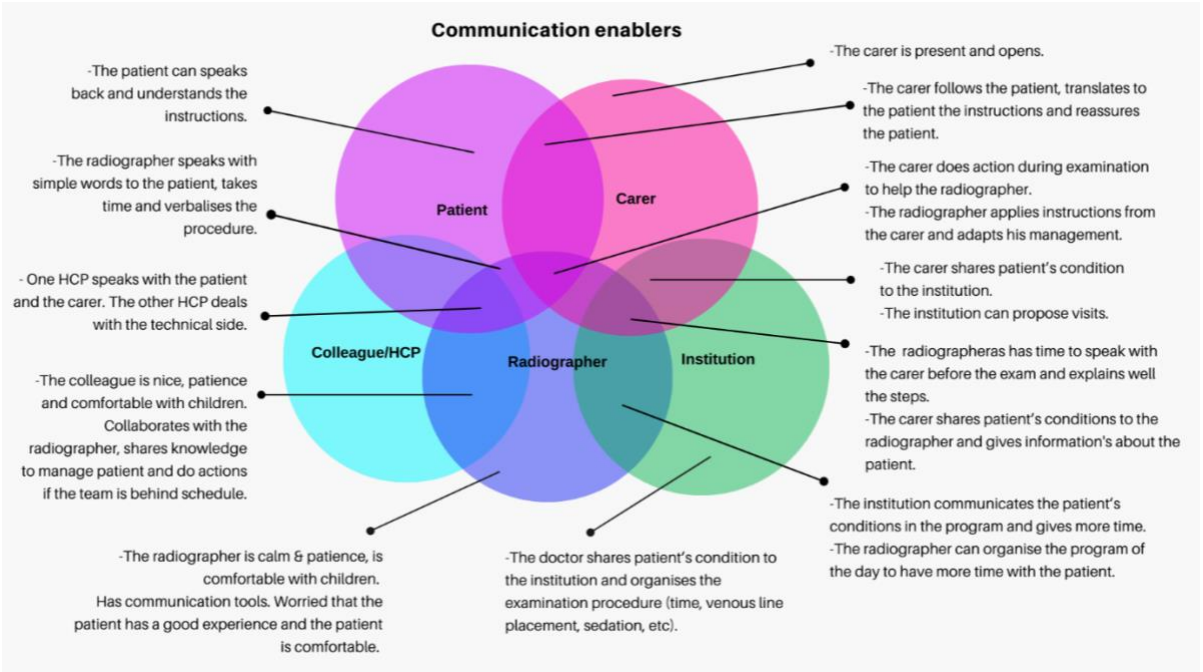

Figure 3. Communication enablers

Communication challenges

The communication of the patient condition was dependent on the institution and examination type, according to the interviewed participants. For MRI examinations, there was most of the times prior communication that the patient was autistic or it was,

at least, mentioned that the patient was vulnerable without specifying the patient's condition. Sometimes the patient condition was shared as a written information inside the patient's file, but in busy handovers there might have not been enough time to check it.

"(…). Because we don't have much information, we don't have time to read the files, probably there is a file somewhere, but we don't have it (…)" (3)

The interviewed also shared that without knowing the patient condition in advance it was harder to organise their planning. However, when that happened, the radiographers always took the necessary time with the patient, even if the rest of the day's planning was impacted. help from other colleagues and re-distributing patients to other available rooms/equipment was necessary to minimise impact on workflows. They explained that sending back the patient to reschedule the examination was seen as the last solution if everything else failed.

(…) it's never happened to us (...) not to take the time and if it doesn't work, to send them back. We take the time, whatever it takes, even if we are (…) 30 minutes behind scheduling, and then if we see that we're falling behind, well, the other rooms/equipment available can take the next patient.

During the interviews, it was highlighted that sometimes the accompanying person did not communicate the condition to the radiographers or to the department. However, most of the time, the carer was asked, if possible, to escort the patient.

" (…). But what struck me the most was that the mother, she didn't tell me anything in any moment! She did not tell me that the (...) son was autistic(...) for me it was essential. I had to know. (…) I would have better understood! (…)" (2)

From the survey, 58.3% of the radiographers found that the lack of training and knowledge about autism was challenging, as well as the lack of local guidelines (40%) and the lack of a good communication within the healthcare services (25%) (multiple-choice) (Fig. 4).

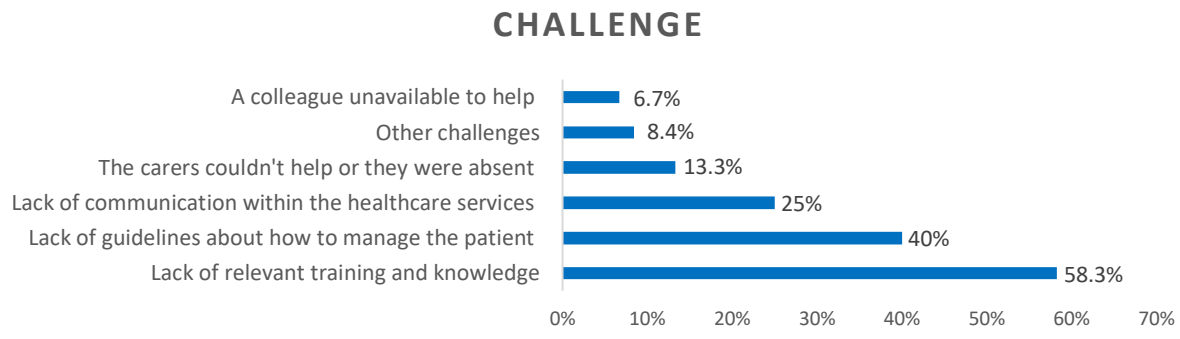

Figure 4. The challenges encountered by Swiss radiographers

According to the interviews, the main challenge concerning the institution was the examination scheduling. The time allocated was the same as a neurotypical patient, not allowing adequate care and no formal protocol was in place to consider patient visits before the examination for some departments.

"(…). The problem with the scanner is that it is an examination that is so fast that you think everything goes quickly! Including the preparation, which is not necessarily the case! (…) We can say to ourselves, yes! You put them on the table, you scan them and then hop! It's done. (…)" (4)

The interviewed also shared that the collaboration with the patient was generally challenging because it was difficult to establish contact to obtain the answers from them to know, for example, what could cause their discomfort. In the case where the carer was absent, one radiographer reported distress due to the challenging interaction and communication with the patient.

"(…) I can't imagine being alone with someone who is autistic, you don't know what to do (…)" (4)

The radiographer doing MRI research on autistic children has experienced incomplete or interrupted MRI examinations, as the children were unable to follow simple instructions and showed challenging behaviour.

The children could be helped familiarise with the procedure with a mock scanner before the MRI, however it was not "like for like" when compared to the real equipment/procedure. The collaboration between the other HCPs and the radiographer was problematic, and the radiographer was not introduced to the children before the mock scanner.

"(…) he didn't want to put himself in the device, in the brain coil. And then put on the headphones. The problem was the headphones because they squeezed his ears. And we tried, I think, for an hour we tried to convince him to put on the headphones or just the earplugs, and he didn't want to. (…)" (5)

Knowledge and education about autism

Most of the radiographers (64/100; 64%) were not sure if they could recognise an autistic patient and 13% were not sure if they interacted with an autistic patient beforehand. The main characteristics of autistic individuals according to participants were "challenging communication skills", "extreme anxiety", "lack of eye contact" and "repetitive movements" (five point Likert scale).

Table 5. Education about autism

Education about autism	n	%
Short duration training about autism (CPD)	2	2%
Lecture at Bachelor 's	1	1%
Working with disabled people	3	3%
Local protocol available at work	0	0%
Not sure if a local protocol is available	28	28%
No local protocol available	71	71%
Personal experience in having an autistic family member	2	2%

Specific training to manage autistic patients was experienced by only 3% of the participants and 3% reported that they had practical experience working with autistic people from lived experience (table 5).

One participant mentioned that a local protocol was available at work, while 28% did not know if a local protocol was available in their department.

For most radiographers (85%), communication with an autistic patient as well as the carers (46%) was considered as very important to be trained on. Understanding the needs of autistic patients (76%), calming the patient (71%), recognising an autistic patient (63%), optimising/modifying the medical imaging examination (43%) were also identified as necessary aspects to be included in the training (multiple-choice).

Some of the interviewed radiographers had some isolated didactic lectures about mental health and disabilities at school. Radiographers with more years of practice received little or no training on communication tools. It was also suggested that more authentic simulated training could enable radiographers to better understand autism. Other training needs included mental health conditions in general but not specific to autistic patients.

"(…) I remember that at school, we dealt with it very briefly (1)

"(…) I think a training course, yes that could be good! Just to have some examples and (…) that someone with autism explains to us what they like and what they don't like (…) but to be (…) in the field, not in the theory! (...) something that is close (…) to the reality. (…) it's mainly that! It's about managing to understand each other in fact. (…)" (3)

Discussion

The findings of this study revealed that participants have experience in managing autistic individuals in their clinical practice as sixty out of a hundred participants declared to have performed examinations in this context, even without any specific training, protocols, or guidelines in place. This results are similar to those already found previously [34], showing that MIDs are not yet fully adapted to provide personalised care to autistic patients.

To overcome the challenges, the participants highlighted the important role of carers/accompanying person in helping and supporting the preparation of the patient, mainly in the paediatric context. When the carers were accompanying the patient, they reduced the anxiety and the motion of the patient by calming and reassuring them. The carers also know better the patient and the way that is preferable to manage the situations by advising and sharing any sensory issues or preferences of the patient to the radiographer. The carer may also help in explaining the radiographer' instructions to the patient. During the examination, the carers played also a role by distracting the patient or reassuring the patient. These approaches of using the carer are highly recommended [4,17,33] since parents, for example, are considered experts in knowing the best way of interaction with their own children, facilitating the examination and providing comfort [17,34].

Several challenges were reported by the participants, regarding the examination planning. The time allocated was typically short, not allowing a detailed explanation or a familiarisation with the context, impacting the imaging acquisition due to patients' extreme anxiety. The exception identified in this study was for the MRI examinations, since radiographers were usually informed by the referral doctor about the patient's condition allowing an adequate preparation. More time was allocated to the examination and/or visits to the room for the patient were scheduled before to experience all steps reducing anxiety as recommended [4,24,28,29]. This might have been because MRI scans are known to be challenging and lengthy and MRI healthcare staff may be more used to consider and apply reasonable adjustments in this context.

Another challenge was the non-communication of the patient's condition beforehand, as 11% of participants answered they never received enough information. This minimises the options for radiographers to adapt the planning and therefore may force them to perform the examinations without adjusting to patients' needs. These challenges are minimised if the condition is communicated in advance, as demonstrated in previously [24,46]. If the carer/family member forewarns the MIDs about the patient's condition, the examination scheduling can be adapted to be integrated during a less busy period or in the end of the shift, and the radiographers will also try to reduce patients' sensory overload. The preparation of the autistic patient seems to depend mainly on the information provided by the carer/family on the day of the scan, and it is them who will seek information about the examinations/procedures to help prepare the autistic patients [46]. The preparation before the examination seems to be critical to prevent challenging behaviours and anxiety. The results showed that a mock scanner can be helpful but only if it is similar to the real equipment/procedure. Previous studies about the examination preparation for MRI examinations were searching for similar environment during the mock scanner, allowing the children to get familiar with. If necessary, the patients could experiment with the mock scanner multiple times until they felt ready and the same staff was present [28,29,35]. To better prepare patients, storybooks, social scripts and/or videos have been developed [24,28–31,35,47]. Autism charities can also assist and inform the parents of autistic children by providing adequate information to prepare them for a health care visit, by sharing information about examinations and explaining their procedures [48,49].

The interviewed participants shared that they had received some training about autism, but they needed more detail and more authentic learning, not just didactic lectures. The findings of the survey also revealed that most of the participants had general knowledge about autism and its characteristics such as "communication challenges' or "sensory issues". Not knowing about the sensory issues, radiographers cannot adequately act to reduce the sensory stimuli as recommended in the literature to reduce the barriers and to deliver health care safely [4,22–24]. None of the participant radiographers reduced the acoustic noise during the procedures and this warrants further investigation.

The survey revealed that only 3% of the participants received training to manage autistic patients, during their undergraduate studies or as continuous professional development (CPD). Lack of relevant training about autism, impacts on practice [20,21,23]. Training should be integrated in medical imaging curricula with emphasis on optimal communication. The use of pictures or flash-cards to communicate about medical imaging, for instance, may help in the preparation and image acquisition [10,30,50,51]. The radiographers highlighted knowing on how to adapt communication as the most needed skill (85%), followed by the understanding of patient's needs (76%). The participants seemed to be dependent of the carer presence. The inclusion of sessions with the presence of autistic patients to share advice on conducting the examinations were also referred as a useful type of training for increased authenticity and maximising impact.

Recommendations for practice

The main recommendations are organised against the patient journey (before, during, in parallel and after), then for patients' and carers' and finally for education and training

(Table 6). The recommendations were based on published work and the data from our survey and interviews.

Table 6. Main recommendations to facilitate person centred care for autistic service users of medical imaging departments

Moment of application	Recommendations	Justifications	Implementation on practice
Before the examination	Communication of the patient's condition to the institution	Scheduling the examination during quiet moments, allow appropriate time duration for each imaging slot, allow pre-visit, organise examination involving different departments for better coordination of workflows.	To develop a scheduling protocol for each imaging modality.
Before the examination	Communication of the patient's condition to the radiographers	To organise a discussion with the service user and/or carer about the best approach to manage the patient. The radiographers know how to act to reduce sensory issues.	To increase collaboration between imaging departments and autism organisations to develop imaging examination procedure guide available for autistic patients and their carer. To optimise communication pathways between autism service users and their carers and HCPs.
During the examination	Providing reasonable adjustments during the examination	To allow the radiographers to modify the environment (light, noise, positioning) to ensure they meet their patients' needs and preferences.	To develop imaging adaptation protocols, in collaboration with patients, service users, Autism organisations and the ASTRM, for implementation at a national level and for raising awareness.
In parallel	Development of short imaging protocol for routine examination (ankle, knee etc.)	To enable the radiographer to perform short examinations to autistic patient	To identify faster optimised protocols with diagnostic quality (by a mutual agreement between radiologists and radiographers).
In parallel	Training sessions with autistic patients with the help of trained healthcare staff (e.g. social worker)	To enable radiographers to understand these patients, to acquire knowledge and communication skills to improve their practice.	Higher education, Institutions, ASTRM could organise this training as a short training in house or a CPD course affiliated with a University.
After the examination	Discussion to enable feedback between the radiographer, the patient and the carers	To enable the radiographer to listen the patient and the carers about the examination to improve the management of autistic patients.	To use an appropriate and calm room for the feedback, to allow time for the radiographer participating

After the examination	Continuous development of the management of autistic patients	To continuously improve the management of autistic patients thought feedbacks and the literature (evidence-based learning). To keep in mind that each autistic person is different, the management must be adapted to each person.	To share knowledge between radiographers in the unit about the specificity of the MID environment to manage autistic patients. To update protocols in relation to the management of autistic patients.

Limitations

The main limitations of the study are related to the period of dissemination. During summertime, radiographers have their main holiday' period, impacting the response rate.

Also having four official languages in the country can be challenging with coverage of the whole population.The current survey was developed only in French and English. This may be a barrier for the Swiss German and Italian radiographers. Only French-speaking radiographers were selected for the interviews, as the main author did not to have the skills to conduct the interviews in German or Italian.

Due to the pandemic, the radiographers were overwhelmed with clinical work, having less time to participate in research.

The results presented here, although they vastly agree with the UK autism-friendly MRI study [39], cannot be generalised beyond the Swiss context, where certain resources, training and provisions are available.

Conclusions

This study has identified the strategies used by Swiss radiographers to manage autistic individuals, the adaptations used in communication and the enablers and challenges to a successful imaging examination. The most common enabler was the support of the carer/accompanying person and the good institutional organisation. The lack of communication on patient's condition, the lack of knowledge and communication tools to work with autistic individuals were highlighted as barriers to the radiographers. The preferences of each patient, the collaboration of the carer and HCPs, and the organisation of each institution need to be better integrated to offer truly personalised MIDs care. Specific training and education were identified as necessary to improve radiographers' knowledge in understanding autism and to better adapt practice to this specific context for the benefit of the autistic patients.

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