A Survey Regarding Acceptance and Awareness of Autopsy imaging (Ai) among Radiological Technologists in Our Institution: Comparison with Those of Two Other Institutions

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Key words: Autopsy imaging (Ai), radiological-technologist, questionnaire survey, postmortem CT, postmortem MRI

Abstract
An anonymous questionnaire survey consisting of 8 questions was conducted to 35 radiological technologists in our institution regarding their feelings and awareness about autopsy imaging (Ai). Among them, 30 subjects (85%) responded, with approximately 60% of them indicating an interest in Ai, mainly for its potential contribution to society. And 90% of the respondents answered an absence of negative feelings associated with the imaging of unnaturally deceased bodies, as a matter of their routine work. However, only 30% of the respondents were aware of two recent Japanese laws regarding death-cause detection, while 70% of the respondents had awareness of a model project for pediatric Ai, suggesting insufficient knowledge of the background and reasoning behind the needs of Ai. Our survey results were compared with two other previously-published surveys. Our comparative investigation suggests necessity of more Ai-related education in training institutes, greater distribution of relevant information by the Japan Association of Radiological Technologists, and the sharing of experiences among hospital staffs, all of which will help meet the needs and social demands of Ai.

1. Introduction

Since the introduction of post-mortem examination scans (Autopsy imaging, hereafter referred to as “Ai”) in 2000¹,², Ai has come into widespread regular practice³⁰ throughout the early adoption phase of the past 10 years⁰⁻⁹. In July 2012, two Japanese laws were introduced regarding the investigation of the cause of death: “Act on the Investigation into the Cause of Death or the Identity of Corpse by Police or Security Forces” (Act of Death Investigation and Identification)¹¹ and “Policy on the Promotion of Corpse Examination” (Policy on Corpse Examination)¹². With the start of enforcement in April 2013, the Act Of Death Investigation And Identification establishes the “implementation of procedures when the police chief rec-
ognizes the need to perform internal bodily exams to determine the cause of death when handling corpses, to the extent required, in order to verify the state of bleeding via body fluid collection, exams to check for drugs and/or poisoning via the collection of body fluid or urine, autopsy imaging, and other examinations prescribed by law”¹³. The Council for the Promotion of Policy on Corpse Examination, responsible for the implementation of the Policy on Corpse Examination, released its final report¹⁴ in April 2014, and made a cabinet decision, “Plan for Promotion of Corpse Examination” in June 2014. Ai is listed as one of those specific measures¹⁵. The “Model Project of Post-Mortem Imaging for Pediatric Deaths” run by the Ministry of Health, Labor and Welfare began in September, 2014¹⁶.
Since our hospital first opened in February 1985, post-mortem computed tomography (CT) has been performed17)–20) to estimate and identify the cause of death in patients who died after being transported to our facility’s emergency department for cardiopulmonary arrest. Among our radiological technologists, the daytime CT lead operator (8:30-17:30) and evening (17:30-22:00) and overnight (22:00-8:30am) on-duty operators perform these post-mortem CT scans. Our hospital is designated as an autopsy center (a facility commissioned by the prefecture to implement dissection with consent according to the administrative autopsy procedures) to perform post-mortem CT scans to guide and supplement dissection, and perform magnetic resonance imaging (MRI) when possible, for abnormal corpses sent by the police for autopsy21)–23) . These pre-dissection post-mortem CT and MRI scans are performed the evening before dissection by a rotation of 5 radiological technologists that have been doing Ai for over 10 years, and/or have received official certification from an Ai certification workshop. Our hospital radiology department is responsible for a wide variety of procedures like common x-rays, ultrasound scans, CT, MRI, nuclear medicine, radiation therapy, and other medical exams24), but the main responsibilities of each individual radiologist are fixed to an extent. That is to say, that we can expect differences between technicians regarding their degree of involvement with Ai, and their levels of interest and knowledge about Ai. Up until now, there have been a few investigations conducted concerning the realities of Ai25)–26), and the The Japan Association of Radiological Technologists (hereafter referred to as “JART”) recently conducted a fact-finding survey about Ai29) that is still being analyzed (personal communication). However, although this Ai awareness survey of radiologists has been mentioned in a few conference presentation abstracts29)–32), very few reports have been published33)–34). We conducted an Ai awareness survey among the radiological technologists at our hospital and are sharing the results here.

### 2. Materials and Methods

The full staff of 35 radiological technologists (male-to-female ratio 24:11, ages 23-47, average age 34) were surveyed anonymously concerning their awareness and knowledge of Ai (survey period April 22-30, 2014). The 8 survey questions are listed in Table 1.

Questions 1 through 7 were multiple-choice. Radiological technologists who answered “I’m interested” to Question 1 also answered Question 2, and Questions 4-8. Radiological technologists who answered “I’m not interested” to Question 1 also answered Question 3, and Questions 4-8. Radiological technologists who answered “I don’t know if I’m interested” to Question 1 also answered Questions 4-8. A blank writing space was provided for elaboration on answers of “Other” for Questions 2-4.

#### Table 1 Questionnaire sheet including 8 questions regarding Ai

<table>
<thead>
<tr>
<th>Question</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Question 1</td>
<td>Do you have an interest in Ai?</td>
</tr>
<tr>
<td></td>
<td>(Yes, I’m interested. / No, I’m not interested. / I don’t know.)</td>
</tr>
<tr>
<td>Question 2</td>
<td>What is the reason for your interest in Ai? (select all that apply)</td>
</tr>
<tr>
<td></td>
<td>(I want to assist in cause of death investigations. / It’s relevant to recent events. / It’s an unknown field for me. / Other (free response).)</td>
</tr>
<tr>
<td>Question 3</td>
<td>What is the reason for your disinterest in Ai? (select all that apply)</td>
</tr>
<tr>
<td></td>
<td>(It makes me uncomfortable. / I just can’t handle it. / Other (free response).)</td>
</tr>
<tr>
<td>Question 4</td>
<td>How do you feel about Ai as a routine part of work?</td>
</tr>
<tr>
<td></td>
<td>(I don’t mind it as a routine part of work. / I don’t want to do it as a routine part of work. / Other (free response).)</td>
</tr>
<tr>
<td>Question 5</td>
<td>Are you willing to conduct Ai following a request from the police?</td>
</tr>
<tr>
<td></td>
<td>(I want to do it. / I don’t mind doing it. / I don’t want to do it.)</td>
</tr>
<tr>
<td>Question 6</td>
<td>Do you know the two laws regarding death cause detection?</td>
</tr>
<tr>
<td></td>
<td>(I know them. / I’ve heard of them. / I don’t know.)</td>
</tr>
<tr>
<td>Question 7</td>
<td>Are you aware of the model project of pediatric Ai?</td>
</tr>
<tr>
<td></td>
<td>(I know it. / I’ve heard of it. / I don’t know.)</td>
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<td>Question 8</td>
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routine part of work?” Ai was defined as post-mortem CT scans performed on patients whose deaths were confirmed at our hospital, either by the emergency department or an inpatient wing. For Question 5 “Are you willing to conduct Ai following a request from the police?” Ai was defined as post-mortem CT scans (or MRI, depending on the case) of abnormal corpses sent to the autopsy center by the police for autopsy and/or post-mortem exam.

The survey results were compared to the results of an Ai survey conducted in 2009 among 43 radiological technologists (citation #33 says 45 people, but it was actually 43) at the Department of Radiology at Gunma University Hospital (hereafter referred to as “Gunma University Survey”) which officially began doing Ai in 2008, and an Ai survey conducted in 2014 among 17 radiology staff members (16 radiological technologists and 1 radiologist) at the medical technology division of Koyama Memorial Hospital (hereafter referred to as “Koyama Memorial Hospital Survey”) which has been doing Ai since 2004 or earlier. The Gunma University Survey included questions that correspond to Question 1 and 4-7 of this survey. The Koyama Memorial Hospital Survey included questions that correspond to Question 1 and 4-7 of this survey. In Question 4 “How do you feel about Ai as a routine part of work?” the answer choices of “I don’t mind it as a routine part of work” “I don’t want to do it as a routine part of work” and “Other” were phrased as “I want to do it” “I don’t mind doing it” and “I don’t want to do it” in the Koyama Memorial Hospital Survey. In order to compare the results more easily, the “I want to do it” and “I don’t mind doing it” responses were classified together as “I don’t mind it as a routine part of work” for convenience in this survey.

3. Results

The survey was completed by 30 out of 35 people (86% completion rate).

Question 1 “Do you have an interest in Ai?”

Among the 30 survey responses, 18 people (60%) selected “Yes, I’m interested,” 8 people (27%) selected “No, I’m not interested,” and 4 people (13%) selected “I don’t know” (Fig. 1).

Question 2 “What is the reason for your interest in Ai?” (select all that apply)

Among the 18 people who responded “Yes, I’m interested” to Question 1, 14 people (78%) selected “I want to assist in cause of death investigations,” 6 people (33%) selected “It’s relevant to recent events,” 5 people (28%) selected “It’s an unknown field for me” and 1 person (6%) selected “Other.” The person who selected “Other” wrote “I feel a societal obligation.”

Question 3 “What is the reason for your disin- terest in Ai?” (select all that apply)

Among the 8 people who responded “No, I’m not interested” to Question 1, nobody selected “It makes me uncomfortable” or “I just can’t handle it.” All 8 people selected “Other,” and 7 of those people wrote a freestyle response. Among the “Other” written responses, 4 people (50%) wrote “No particular reason,” 1 person (13%) wrote “It has nothing to do with my job,” 1 person (13%) wrote “I don’t feel familiar with Ai” and 1 person (13%) wrote “Unlike living bodies, I don’t think it will provide any useful knowledge that can be used in future examinations.”

![Fig. 1 Ratio of respondents regarding the first question, “Do you have an interest in Ai?”](image)
Question 4 “How do you feel about AI as a routine part of work?”

Among the 30 survey responses, 27 people (90%) responded “I don’t mind it as a routine part of work.” Among their answers to Question 1, 16 out of 18 people (89%) selected “I’m interested.” 7 out of 8 people (87%) respond “I’m not interested” and 4 out of 4 people (100%) selected “I don’t know.” On the other hand, there were no radiological technologists who selected “I don’t want to do it as a routine part of work.” The 3 remaining people selected “Other” (Fig.2a, b, c) and 2 of those people wrote a freestyle response. 1 person (33%) wrote “I don’t think it’s necessary for cases where the cause of death of obvious” and 1 person (33%) wrote “I hate that you can’t read the date and time.”

Question 5 “Are you willing to conduct AI following a request from the police?”

Among the 30 survey responses, 6 people (20%) selected “1 want to do it” regarding police requests, 16 people (54%) selected “I don’t mind doing it” and 7 people (23%) selected “I don’t want to do it.” (Fig.3).

Question 6 “Do you know the two laws regarding death cause detection?”

Among the 30 survey responses, 9 people (30%) selected “I know them” regarding the two laws, 2 people (7%) selected “I’ve heard of them” and 19 people (63%) selected “I don’t know.” (Fig.4).

<table>
<thead>
<tr>
<th>Tsukuba Medical Center (2014)</th>
<th>Gunma University (2009)</th>
<th>Koyama Memorial Hospital (2014)*4</th>
</tr>
</thead>
<tbody>
<tr>
<td>I don’t mind</td>
<td>16 people (58%)</td>
<td>17 people (71%)</td>
</tr>
<tr>
<td>I don’t want to do it</td>
<td>4 people (15%)</td>
<td>1 person (4%)</td>
</tr>
<tr>
<td>Other</td>
<td>2 people (7%)</td>
<td>1 person (4%)</td>
</tr>
</tbody>
</table>

*4 Because different facilities had different sets of questions. “I want to do it” and “I don’t mind doing it” were combined as “I don’t mind.”

<table>
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<tbody>
<tr>
<td>I don’t mind</td>
<td>27 people (90%)</td>
<td>28 people (88%)</td>
</tr>
<tr>
<td>I don’t want to do it</td>
<td>3 people (10%)</td>
<td>4 people (14%)</td>
</tr>
<tr>
<td>Other</td>
<td>1 person (3%)</td>
<td>1 person (4%)</td>
</tr>
</tbody>
</table>

*5 Because different facilities had different sets of questions. “I want to do it” and “I don’t mind doing it” were combined as “I don’t mind.”

**Fig.2 a** Acceptance of AI regarding the 4th question, “How do you feel about AI as a routine part of work?” (to respondents who indicated an interest in AI)

**Fig.2 b** Acceptance of AI regarding the 4th question, “How do you feel about AI as a routine part of work?” (to respondents who indicated no interest in AI)

**Fig.2 c** Acceptance of AI regarding the 4th question, “How do you feel about AI as a routine part of work?” (to all respondents)

**Fig.3** Acceptance regarding the 5th question, “Are you willing to conduct AI following a request from the police?”
Question 7 “Are you aware of the model project of pediatric Ai?”

Among the 30 survey responses, 21 people (70%) selected “I know it” regarding the project, no one selected “I've heard of it” and 9 people (30%) selected “I don't know.” (Fig.5).

Question 8 “Please write your thoughts about Ai.”

Among the 30 survey responses, 5 people wrote the following freestyle comments: “I first heard about Ai back when I was a student, so I accept it as a part of work in this field.” “Post-mortem MRI aren’t usually done in other facilities so I'm interested in it, but I'm worried whether I can do it well.” “I want to know the background that led to the creation of the pediatric Ai model project.” “If radiological technologists can assist with identifying the cause of death, we should do it positively.” “I think that performing Ai is an important opportunity for the radiology department (the radiological technologists doing the imaging and the radiologists that make the diagnosis) to view the whole body structure.”

4. Discussion

The proportion of radiological technologists who said they have an interest in Ai was greater than half of the respondents at all 3 facilities. Only our hospital’s survey asked for the reason why the respondents had an interest in Ai or not, and we found that the motivation for interested respondents was their contribution to society rather than their own personal interest. We also found that uninterested respondents were not motivated by feelings of discomfort, and that they might become interested in Ai if work related to Ai was to increase at their workplace.

The proportion of radiological technologists who said they don’t mind it as a routine part of work was greater than two-thirds of the respondents at all 3 facilities. The freestyle comment “I first heard about Ai back when I was a student, so I accept it as a part of work in this field” leads us to believe that if a greater number of radiological technologist training facilities (universities and trade schools) included Ai in the course curriculum, we can predict that a greater proportion of radiological technologists would consider Ai to be a routine part of work.

The percentage of radiological technologists who said “I want to do it” or “I don’t mind doing it” regarding police request Ai was 74%, lower than the 90% of respondents who answered “I don't mind doing it as a routine part of work.” While no radiological technologists at this hospital selected “I don't want to do it as a routine part of work,” 7 people said that they don’t want to do police request Ai. It is thought that they might be motivated by the following two reasons: First, because police request Ai at
our facility is restricted to only 5 members of our radiology staff, the remaining radiological technologists aren’t as familiar with police request Ai compared to Ai as a routine part of work. Second, the freestyle comment “Post-mortem MRI aren’t usually done in other facilities so I’m interested in it, but I’m worried whether I can do it well” leads us to believe that because police request Ai means post-mortem MRI, it involves a greater responsibility than work performing post-mortem CT scans. A study group report on the use of post-mortem examination scans says “Ideally, radiological technologists that completed training held by organizations like the JART should be performing post-mortem scans, and we ought to consider making this a certification subcategory inside JART’s certification system”[8]. As of 2011, JART implemented a certification process for Ai-certified radiological technologists[9], according to the following criteria.

- Applicant has been granted a radiological technologist license and has 5 years or more work experience, including at least 2 years of CT scan experience.
- Applicant has taken JART’s radiological technologist basic training “X-Ray CT Examination” and an Ai certification workshop.
- Applicant has previous experience inspecting post-mortem imaging.

These certification requirements show that in order to take CT scans that are useful in cause of death investigations, a radiological technologist needs a good command of the same technical skill and knowledge that is used in everyday clinical work with living bodies. It might be more difficult to perform post-mortem MRI than post-mortem CT scans.

The proportion of respondents that knew the two relevant laws was between one-fourth and one-third. Because an increase in police request Ai commissions is expected in the future[10], it would be ideal for the radiological technologists performing these scans to know the background of this work. Currently, the Ai certification workshop is held three times a year[11], but the number of students is limited to 100 people each time. The JART believes that it’s necessary to convey the importance of performing Ai to more radiological technologists not only through certification workshops, but also by holding a symposium of the JART general members and by increasing the frequency of awareness measures[12] like publishing articles about Ai in the Journal of JART.

The proportion of respondents that knew about the pediatric Ai model project was higher at our hospital than in the Koyama Memorial Hospital Survey. It is thought that they might be motivated by the following two reasons: First, our hospital’s radiology department held a study session about Ai just two weeks before this survey was done, and the pediatric Ai model project was also discussed, so it’s expected that anyone who attended that session would select “I know it.” Second, our hospital has a pediatrics department, but Koyama Memorial Hospital does not (note: there is a neonatology department.) One of the purposes of the pediatric Ai model project is to identify child abuse[13]. Every year, there are a few requests from our pediatrics department to take full-body x-rays[14][15] to confirm the presence of physical abuse; this leads us to think that our radiological technologists can easily understand the purpose of the pediatric Ai model project, and have a greater interest in it. The freestyle comment “I want to know the background that led to the creation of the pediatric Ai model project” reflects this as well.

This paper’s scope is limited because we could only compare the survey from our hospital with two other facilities. It’s possible that completely different results could be obtained at other facilities with a different number of staff, range of ages, or male-to-female ratio. A nationwide survey with a greater number of
questionnaires will be necessary for future research. This paper will also become comparison data for that project.

Japan is rapidly aging, and is entering a phase when death will be commonplace in society40). Even though Japan is often called a society that doesn’t investigate the cause of death1) 2), there are great expectations for Ai as the rate of dissection fails to rise41). 90.4% of Ai practitioners are radiological technologists6). Just as the freestyle comment “If radiological technologists can assist with identifying the cause of death, we should do it positively” suggests, we radiological technologists need to respond to the societal demand for Ai. In order to achieve that, it is necessary to establish Ai as a field of study at radiological technologist training facilities42) 43) and continue the ongoing implementation of JART’s Ai certification workshops and positive public relations work. Given that “performing Ai is an important opportunity for the radiology department... to view the whole body structure,” results could be achieved through Ai study sessions held across a variety of hospital departments including general medicine, nursing, clinical laboratories, and administration, as well as an increase in communication between facilities43), and active participation in Ai-related academic circles45).

Acknowledgments

Doctor Toshihiro Yokoyama, Director of Radiology and Vice-Director of the Medical Technology Division at Zenjinkai Group Koyama Memorial Hospital shared the results of his hospital’s survey with us. This research was funded by the Daiwa Securities Health Foundation.

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