

# Knowledge and attitudes of Polish prosecutors and general Polish population in regards to post-mortem computed tomography in 2019

Wiedza i postawy polskich prokuratorów i ogółu społeczeństwa w odniesieniu do pośmiertnej tomografii komputerowej w 2019 r.

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## Abstract

Post-mortem computer tomography (PMCT) is an imaging technique that is gaining popularity both worldwide and in Poland. It provides certain benefits in death investigation that a conventional autopsy is not able to, however, it has significant limitations. As PMCT and post-mortem computed angiography (PMCTA) continue to develop in this country, it is critical to become aware what people know and think about these imaging techniques, especially the prosecutors who officially order such examinations to be performed. In 2019, two concurrent surveys were administered to Polish prosecutors and general Polish population, respectively, regarding their current knowledge and opinions on PMCT. The results were collected both online and on paper, and then subjected to analysis. In total, 92 prosecutors and 227 non-prosecutors responded to the survey. The present authors observed that while prosecutors were more likely to have heard of this examination than the general public, their knowledge was often inadequate or incorrect. Conventional autopsy was still held as the gold standard in death investigation. However, a good popular sentiment towards PMCT was shown, and a desire to learn more about it – not just among prosecutors, but among the general public as well. The present authors' recommendation is that more courses and training should be organised for Polish prosecutors to compensate this knowledge gap.

## Keywords

Post-mortem computed tomography, Post-mortem computed tomography angiography, Polish prosecution, Polish general public, survey

## Streszczenie

Pośmiertna tomografia komputerowa (PMCT) to technika obrazowania, która zyskuje coraz większą popularność zarówno na świecie, jak i w Polsce. Zapewnia pewne korzyści w badaniu śmierci, których nie jest w stanie zapewnić konwencjonalna sekcja zwłok, ma jednak istotne ograniczenia. Ponieważ w naszym kraju nadal rozwija się PMCT i pośmiertna angiografia komputerowa (PMCTA), niezwykle ważne jest, aby dowiedzieć się, co ludzie wiedzą i myślą o tych technikach obrazowania, zwłaszcza prokuratorzy, którzy oficjalnie zlecają przeprowadzanie tego rodzaju badań. W 2019 r. przeprowadzono dwie równoległe ankiety, odpowiednio wśród polskich prokuratorów i ogółu polskiego społeczeństwa, dotyczące ich aktualnej wiedzy i opinii na temat PMCT. Wyniki zebrano zarówno online, jak i w wersji papierowej, a następnie poddano analizie. W sumie w ankiecie wzięło udział 92 prokuratorów i 227 osób niebędących prokuratorami. Autorzy zaobserwowali, że chociaż prokuratorzy częściej słyszeli o tym badaniu niż ogół społeczeństwa, ich wiedza była często niewystarczająca lub nieprawidłowa. Konwencjonalna sekcja zwłok była nadal złotym standardem w dochodzeniu przyczyn śmierci. Wykazano jednak powszechne dobre nastawienie do PMCT i chęć dowiedzenia się o nim więcej – nie tylko wśród prokuratorów, ale także wśród ogółu społeczeństwa. Autorzy niniejszego artykułu zalecają organizację większej liczby kursów i szkoleń dla polskich prokuratorów w celu uzupełnienia tej luki w ich wiedzy.

## Słowa kluczowe

pośmiertna tomografia komputerowa, pośmiertna angiografia tomografii komputerowej, polska prokuratura, polska opinia publiczna, badanie ankietowa

## Introduction

The last two decades of the 20<sup>th</sup> century mark the beginning of use of post-mortem computed tomography (PMCT), and its international application in forensic medicine has only grown since then [1]. Forensic doctors have learned that PMCT can be a beneficial supplement [3, 4, 7, 9] or even a potential replacement for traditional autopsy [5, 6] in determining cause of death, despite its limitations [1, 8, 25], especially when it comes to changes in organ parenchyma and soft tissues, like bruises or contusions. Even now, researchers continue to develop new techniques using PMCT, such as post-mortem computed tomography angiography (PMCTA) [1, 2].

Within the last decade, the usage of both PMCT and PMCTA has also been on the rise in Poland, mainly thanks to the use of European Union funds. Forensic medical professionals in this country have learned much about the advantages and disadvantages of this examination during this time. Now that PMCT's horizons are expanding more than ever, it is crucial to discover what individuals involved directly (prosecutors [10]) and indirectly (general public) in post-mortem investigations in Poland know and think about this type of examination.

## Aim

The purpose of this study was to survey and compare Polish prosecutors and the general public in Poland on their knowledge and opinions concerning PMCT.

## Methods and materials

### Survey for prosecutors

An anonymous online survey was created using Google Forms. A paper version with the same questions was also available. The survey was written in Polish. Questions for the survey were checked for content and face validity by the researchers. The survey consisted of demographic questions in regard to age, sex, and level of the prosecutor's office at which the respondent was employed at the time (in the ascending order of civil organization: "Prokuratura Rejonowa" [translated as District Prosecutor's Office], "Prokuratura Okręgowa" [translated as Regional Prosecutor's Office], "Prokuratura Regionalna" [translated as Provincial Prosecutor's Office], "Prokuratura Krajowa" [translated as National Prosecutor's Office]), followed by 10 questions regarding PMCT. The latter concerned the following issues: whether or not the prosecutor had heard of PMCT (and if so, when and where); if (s)he believed that it was possible to perform such an examination in Poland; given a list of potential advantages of using PMCT, which (s)he believed to be true; which true advantage (s)he further believed to be the most important; what her/his opinion was in regard to utilizing PMCT; what her/his opinion was when comparing PMCT with traditional autopsies; in which types of cases (s)he would refer to PMCT; in which particular case type (s)he believed using this type of post-mortem examination was necessary; her/his opinion on PMCT result reliability in relation to traditional autopsy results; whether costs of the examination would influence her/his decision to refer to PMCT; whether (s)he had heard that PMCTA was possible and whether it was more use-

ful than traditional autopsy in finding injuries and pathologies in the cardiovascular system; and, ultimately, whether (s)he was interested in learning more about PMCT. The questions were mainly of the multiple choice type with one or more choices, with four open-ended (short answer) questions – one regarding the age of the prosecutor, one to describe the training course in which they had heard of PMCT in the case of choosing such an option in the previous multiple choice question, and two to describe what they meant if they chose the option of “Other” in the preceding multiple choice question.

The survey was made available to respondents between 17 June 2019 and 17 July 2019. A total of 92 prosecutors answered, with 78 completing the survey online, and 19 on paper. 57% of respondents (n=52, mean age: 38.2 years) were female, while 43% (n=40, mean age: 39.7 years) were male. Ages ranged from 25 to 61 years. The majority (79%, n=72) of prosecutors who returned the survey represented “Prokuratury Rejonowe” offices, with 13% (n=12) representing “Prokuratura Okręgowa” offices, and only 4% working at “Prokuratura Regionalna” (n=4) or “Prokuratura Krajowa” (n=4) offices, respectively. All prosecutor’s offices taking part in the survey were located in regions of Poland in which it was possible to perform PMCT.

### Survey for the general population

An anonymous online survey for the general Polish population was also created using Google Forms. Questions for the survey were checked for content and face validity by the researchers. With a total of 20 questions, the survey included demographic questions about age, sex, level of education, place of respondent’s origin, whether or not the respondent was a prosecutor (if yes, the survey would link directly to the version for prosecutors described above, and the respondent’s answers would not be saved under the general population survey), whether the respondent was interested in medicine or had familial ties to the medical field, as well as questions regarding PMCT: if the respondent had heard about PMCT; if (s)he believed that it was possible to perform such an examination in Poland; in what situation (s)he believed that PMCT could come in useful; given a list of potential advantages of using PMCT, which (s)he believed to be true; which true advantage (s)he believed was the most important; her/his general opinion on using PMCT; his/her general opinion on PMCT versus traditional autopsies; whether (s)he would agree to a PMCT examination and/or a traditional autopsy in the event of a loved one’s death, as well as whether (s)he would prefer a PMCT to be administered in general or only in the case when no autopsy was to be performed; whether (s)he had heard that PMCTA was possible and whether it was more useful than traditional autopsy in finding injuries and pathologies in the cardiovascular system; and if (s)he was likewise interested in learning more about PMCT. The questions again were mainly multiple choice with one or more choices, with one open-ended (short answer) question regarding the age of the respondent.

The survey was made available to respondents between 10 June 2019 and 14 July 2019. Links to the survey were posted on various social media platforms by one of the authors; there were no limitations as to who could complete the survey. There was a total of 228 respondents, with 71.5% (n=163, mean age: 30.1 years) being female, and 28.5% (n=65, mean age: 30.4 years) being male. The range of ages was between 19 and 76 years. 60% (n=136) had higher education, while 40% (n=92) had only completed secondary education. The highest percentage of respondents, i.e. 37% (n=85) represented cities with the population of up to 50 thousand, followed by residents of cities with the population exceeding 250 thousand (26%, n=60), then residents of smaller towns or villages (20%, n=45), and finally those who lived in cities with the population ranging between 50 and 250 thousand (17%, n=38). Slightly less than half of the respondents (46%, n=106) were associated with medicine, while a little more than half (54%, n=123) had a family member associated with medicine.

### Statistical analysis

In certain questions which were found in both surveys, Pearson’s chi-squared tests were used to perform statistical analysis. *p* values of less than 0.05 ( $p < 0.05$ ) were considered statistically significant.

## Results

### Survey for prosecutors

Most prosecutors (72%, n=66) responding to the survey had heard of PMCT before, out of which 52% (n=34) had learned about it within the previous month. Only 18% (n=12) had first heard about this type of post-mortem examination more than one year earlier, while the remaining group (30%, n=20) had heard about it within the last year. 45% (n=30) of respondents had learned about the existence of PMCT in connection with their profession, with the highest percentage (60%, n=17) having first encountered this concept during professional training. 64% (n=59) of respondents declared that they believed that PMCT was available in Poland, with the remaining 36% (n=33) choosing the option of “I do not know”.

When provided a list of potential advantages inherent to PMCT, the choices that respondents indicated as true are presented in Table 1.

Out of the above options, 29% (n=27) of respondents chose the advantage that PMCT “provides the opportunity to repeatedly analyse the results of the study from different angles, by various specialists at any time after the death of the examined person (which is important when giving opinions on matters concerning malpractice by specialists in various fields, and in some situations may prevent exhumation)” as the most important true option. The fact that PMCT “allows location of small foreign bodies (shot pellets, bullet or explosive fragments, etc.)” (11%, n=10) and “does not affect corpse structure or appearance” (11%, n=10) were the second most popular op-

**Table 1. Number and percentage of total of prosecutors who indicated the given potential advantages of PMCT as true**

Potential advantage of PMCT	Number of answers	Percent
Provides the opportunity to repeatedly analyse the results of the study from different angles, by various specialists at any time after the death of the examined person (which is important when giving opinions on matters concerning malpractice by specialists in various fields, and in some situations may prevent exhumation)	58	63%
Allows location of small foreign bodies (shot pellets, bullet or explosive fragments, etc.)	51	55.4%
Allows for a more accurate assessment of bone injury than traditional autopsy	50	54.3%
Does not affect corpse structure or appearance	47	51.5%
Enables visualization using 3D reconstruction and 3D printing, facilitating the understanding of autopsy results by persons not associated with medicine (including during court hearings)	46	50%
Allows the visualisation of partially healed fractures	41	44.6%
Facilitates identification of unidentified corpses by highlighting features of the body inaccessible or difficult to access during traditional autopsy, such as dental treatment, shape of the paranasal sinuses, bone scars, etc.	39	42.4%
Enables examination of a corpse in situations in which it is unable to be opened due to the risk involved, such as infectious disease, radiation, etc.	38	41.3%
Is a completely objective examination	33	35.9%
Is the best type of post-mortem examination in the case of mass events, e.g. plane crashes	28	30.4%
Shows the presence of gas in various body spaces, which is impossible or difficult during traditional autopsy	19	20.7%
Allows for a more accurate assessment of bruises and contusions than traditional autopsy	18	19.6%
Is more socially acceptable than traditional autopsy	12	13%
In some cases, its result is sufficient to waive traditional autopsy	6	6.5%
Allows for unequivocal determination of cause of death in all cases	4	4.3%
Other (e.g. 'Useful for stab wounds', 'During application', 'None')	3	3.3%
Eliminates the need for additional tests, including the level of ethanol or other toxicological compounds	1	1.1%

tions, followed by the benefit that it “allows for a more accurate assessment of bone injury than traditional autopsy” (9%, n=8).

49% (n=45) of prosecutors responding to the survey claimed that PMCT should never replace traditional autopsy and should only be used as a supplementary examination. However, six respondents (7%) posited that PMCT should completely replace traditional autopsies, while 26 (n=28%) answered that the examination could be used instead of traditional autopsy in certain cases. When this latter group was asked to elaborate on which types of cases, 13 stated that PMCT could be used for corpses with late post-mortem changes (including putrefaction), 9 in the event of exhumations, and 8 when death is suspected to be due to illness (without suspected malpractice). Nobody (n=0) chose the option that PMCT is unnecessary. Answering a different question, the majority of prosecutors (83%, n=76) expressed a belief that there were differences in visualisation between traditional autopsy methods and PMCT, and that both techniques should be used jointly. In yet another question, 26% (n=24) of prosecutors would accept a PMCT examination as equal to a traditional autopsy if only one of the two studies were to be performed. Half (n=46) responded that their opinion as to the credibility of PMCT would depend on

the type of case, while 11% (n=10) would always believe PMCT to be less reliable than traditional autopsy.

Given a list of potential cases, the choices that the respondents marked as significant enough to refer to a PMCT examination are shown in Table 2. When asked which of these case types would absolutely necessitate PMCT, answers varied from 1 (n=1, deaths made widely known by media reports) to 16% (n=15, murders and battery).

Most respondents (64%, n=59) did not know whether or not it was possible to perform PMCTA at all, but 26% (n=24) did. Out of those who did, the majority opinion (75%, n=18) was that PMCTA contrasting allowed for easier identification of injuries and pathological diagnoses which could have led to death than traditional autopsy. The remaining quarter (n=6) answered “I do not know”.

Finally, when asked about costs of PMCT influencing the opinion of referring to such an examination, around half of responding prosecutors (51%, n=45) claimed that financial concerns would not influence their decision. The vast majority (92%, n=85) indicated that they would be interested in learning more about PMCT.

**Table 2. Number and percentage of total of prosecutors who chose the given options cases in which PMCT would be significant**

Cases in which PMCT referral would be significant	Number of answers	Percent
Mass disasters	49	53.3%
Charred corpses	44	47.8%
Murders and battery	43	46.7%
Victims of aviation accidents	43	46.7%
Corpses with late post-mortem changes (including putrefaction)	40	43.5%
Exhumations	39	42.4%
Autopsy after previously performed autopsy	32	34.8%
Suspected malpractice	32	34.8%
Deaths of persons of unknown identity	31	33.7%
Victims of motor vehicle accidents	31	33.7%
Falls from heights	26	28.3%
Suspected death due to illness (without suspected malpractice)	20	21.7%
Deaths made widely known by media reports	16	17.4%
Asphyxia (accidental and suicidal)	12	13%
Rapes	5	5.4%
Other (e.g. 'In cases where PMCT would bring in new information', 'Molestations', 'Gunshot wounds', 'Injuries from wounds suitable for identification', 'I do not know this method, nor its advantages or disadvantages')	5	5.4%

### Survey for general population

Most respondents (65%, n=148) had not heard of PMCT before. About half (51%, n=115) were unsure whether or not such an examination was possible to be performed in Poland, but 43% (n=98) did believe that it was. The majority (80%, n=182) were of the opinion that PMCT can be used for both deaths in hospitals (i.e. clinical medicine) as well as deaths under medico-legal investigation (i.e. forensic medicine).

When provided a list of potential advantages inherent to PMCT, the choices that respondents in this survey indicated as true are presented in Table 3. When asked to choose only one true option as the most significant, the most popular (38%, n=86) was that PMCT “provides the opportunity to repeatedly analyse the results of the study from different angles, by various specialists at any time after the death of the examined person (which is important when giving opinions on matters concerning malpractice by specialists in various fields, and in some situations may prevent exhumation)”. 15% (n=33) indicated that PMCT “does not affect corpse structure of appearance”, while “allowing for a more accurate assessment of bone injury than traditional autopsy” and “facilitating identification of unidentified corpses by highlighting features of the body inaccessible or difficult to access during traditional autopsy, such as dental treatment, shape of the paranasal sinuses, bone scars, etc.” were each chosen by 7% (n=16).

53% (n=121) of respondents held a general opinion that PMCT could replace traditional autopsy in certain cases. 27% (n=62) believed that PMCT should never replace traditional autopsy, while 7% (n=16) opined that it could and should completely replace traditional autopsy. 13% (n=28) were of no opinion. A large portion of the general public (82%, n=183) believed that PMCT and traditional autopsy have different strengths, and are better used together, but 15% (n=34) went so far as claiming that despite their differing advantages, PMCT is a better option as it does not require the body and internal organs to be cut open.

In the event of a loved one’s death and the ability to choose what post-mortem examinations would take place, most (74%, n=167) would agree to both a traditional autopsy and PMCT. A quarter (n=57) would agree to perform only PMCT. Just 1% (n=3) would agree for a traditional autopsy only. In situations where a deceased loved one was already referred to autopsy, 72% (n=163) would like a referral to PMCT as well; 25% (n=58) were unsure. Likewise, if a deceased loved one was not referred to autopsy, 76% (n=173) would like to have the option of performing PMCT at their own cost; 16% (n=37) were unsure, while 8% (n=17) did not.

When asked about the possibility of performing PMCT with a vascular contrasting agent (i.e. PMCTA), a greater number of respondents did not know if it was possible (47%, n=107) or did

Table 3. Number and percentage of total of the general population who indicated the given potential advantages of PMCT as true

Potential advantage of PMCT	Number of answers	Percent
Does not affect corpse structure or appearance	173	76.2%
Provides the opportunity to repeatedly analyse the results of the study from different angles, by various specialists at any time after the death of the examined person (which is important when giving opinions on matters concerning malpractice by specialists in various fields, and in some situations may prevent exhumation)	173	76.2%
Allows location of small foreign bodies (shot pellets, bullet or explosive fragments, etc.)	151	66.5%
Enables examination of a corpse in situations in which it is unable to be opened due to the risk involved, such as infectious disease, radiation, etc.	147	64.8%
Allows for a more accurate assessment of bone injury than traditional autopsy	144	63.4%
Shows the presence of gas in various body spaces, which is impossible or difficult during traditional autopsy	131	57.7%
Enables visualization using 3D reconstruction and 3D printing, facilitating the understanding of autopsy results by persons not associated with medicine (including during court hearings)	122	53.7%
Facilitates identification of unidentified corpses by highlighting features of the body inaccessible or difficult to access during traditional autopsy, such as dental treatment, shape of the paranasal sinuses, bone scars, etc.	113	49.8%
Allows the visualisation of partially healed fractures	110	48.5%
Is more socially acceptable than traditional autopsy	110	48.5%
In some cases, its result is sufficient to waive traditional autopsy	88	38.8%
Allows for a more accurate assessment of bruises and contusions than traditional autopsy	71	31.3%
Is a completely objective examination	66	29.1%
Is the best type of post-mortem examination in the case of mass events, e.g. plane crashes	48	21.1%
Allows for unequivocal determination of cause of death in all cases	30	13.2%
Eliminates the need for additional tests, including the level of ethanol or other toxicological compounds	7	3.1%

not think it was (23%, n=53). When further questioned as to whether adding a contrasting agent in such a manner would aid in finding injuries or pathological changes which had led to death, 34% (n=78) of the total surveyed general population answered “yes”, 5% “no” (n=11). The remaining 138 respondents (61%) indicated that they had chosen the answers “I do not know” or “no” in response to the previous question as to whether PMCTA was possible.

About three-quarters (76%, n=172) were interested in learning more about PMCT.

#### Statistical comparison of survey results in selected questions

A chi-square test was used to find whether hearing about PMCT in the past was associated with being a prosecutor (as compared to a member of the general public). The result was statistically significant,  $\chi^2(1, N=3.19) = 6.6826$ ,  $p = <.0001$ . Prosecutors were more likely to have heard about PMCT than an average person.

Chi-square testing was also used to check whether being a prosecutor or not influenced one’s accuracy when selecting true potential advantages of PMCT, i.e. that PMCT does not af-

fect corpse structure or appearance [1, 5], allows for a more accurate assessment of bone injury than traditional autopsy [15, 16, 21, 28], shows the presence of gas in various body spaces, which is impossible or difficult during traditional autopsy [1-3, 5, 6], is more socially acceptable than traditional autopsy [5], provides the opportunity to repeatedly analyse the results of the study from different angles by various specialists at any time after the death of the examined person [2], is the best type of post-mortem examination in cases of mass events [9, 17-20, 27], facilitates identification of unidentified corpses by highlighting features of the body inaccessible or difficult to access during traditional autopsy [14, 17-20], allows location of small foreign bodies [23, 26], enables examination of a corpse in situations in which it is unable to be opened due to the risk involved [1], enables visualization using 3D reconstruction and 3D printing [22-23], is a completely objective examination [1-3], and allows the visualisation of partially healed fractures. The results are listed in Table 4.

Chi-square testing was also used to test whether being a prosecutor or not influenced one’s choice of answers when it came to choosing potential advantages of PMCT inaccurately, i.e. that PMCT allows for more accurate assessment of bruises and



**Table 4. Percentage of prosecutors vs. general population that correctly indicated a true potential advantage of PMCT, as well as Chi-squared statistic values and p-values for each choice; statistically significant relationships ( $p < .05$ ) are italicized**

True potential advantage of PMCT	Percent of prosecutors who chose option	Percent of general population who chose option	Survey group which chose option in greater proportion	chi-square statistic value	p-value
Shows the presence of gas in various body spaces, which is impossible or difficult during traditional autopsy	20.7%	57.7%	General population	36.0885	<.00001
Is more socially acceptable than traditional autopsy	13%	48.5%	General population	34.7652	<.00001
Does not affect corpse structure or appearance	51.5%	76.2%	General population	19.3082	.000011
Enables examination of a corpse in situations in which it is unable to be opened due to the risk involved, such as infectious disease, radiation, etc.	41.3%	64.8%	General population	14.7822	.000121
Provides the opportunity to repeatedly analyse the results of the study from different angles, by various specialists at any time after the death of the examined person (which is important when giving opinions on matters concerning malpractice by specialists in various fields, and in some situations may prevent exhumation)	63%	76.2%	General population	5.6826	.017134
Is the best type of post-mortem examination in the case of mass events, e.g. plane crashes	30.4%	21.1%	Prosecutors	3.1129	.07767
Allows location of small foreign bodies (shot pellets, bullet or explosive fragments, etc.)	55.4%	66.5%	General population	3.4637	.062729
Allows for a more accurate assessment of bone injury than traditional autopsy	54.3%	63.4%	General population	2.2691	.131975
Facilitates identification of unidentified corpses by highlighting features of the body inaccessible or difficult to access during traditional autopsy, such as dental treatment, shape of the paranasal sinuses, bone scars, etc.	42.4%	49.8%	General population	1.4327	.231328
Is a completely objective examination	35.9%	29.1%	Prosecutors	1.4122	.234698
Allows the visualisation of partially healed fractures	44.6%	48.5%	General population	0.398	.528129
Enables visualization using 3D reconstruction and 3D printing, facilitating the understanding of autopsy results by persons not associated with medicine (including during court hearings)	50%	53.7%	General population	0.3682	.543978

**Table 5. Percentage of prosecutors vs. general population that incorrectly indicated a false potential advantage of PMCT as being true, as well as Chi-squared statistic values and p-values for each choice; statistically significant relationships ( $p < .05$ ) are italicized**

False potential advantage of PMCT	Percent of prosecutors who chose option	Percent of general population who chose option	Survey group which chose option in greater proportion	chi-square statistic value	p-value
In some cases, its result is sufficient to waive traditional autopsy	6.5%	38.8%	General population	32.7501	<.00001
Allows for unequivocal determination of cause of death in all cases	4.3%	13.2%	General population	5.4067	.020059
Allows for a more accurate assessment of bruises and contusions than traditional autopsy	19.6%	31.3%	General population	4.4645	.034606
Eliminates the need for additional tests, including the level of ethanol or other toxicological compounds	1.1%	3.1%	General population	1.0676	.301494

contusions than traditional autopsy [5, 6, 8], allows for unequivocal determination of cause of death in all cases [1, 3-6], eliminates the need for additional tests [3], and in some cases, its result is sufficient to waive traditional autopsy [10, 29-30]. The results are listed in Table 5.

As can be seen in the data presented above, prosecutors in general were less likely to indicate the true potential benefits of PMCT than the average population. They were, however, likewise less likely to indicate false potential benefits of the study.

## Discussion and conclusions

The results of the present study showed that prosecutors were more likely to have heard about PMCT in the past than the general public, and that this was correlated with the fact that they were prosecutors in the first place. This correlation was confirmed both with follow-up questions answered by the respondents themselves, as well as with statistical analysis. However, about half had only learned about PMCT's existence within the last month, despite PMCT having been available in Poland since 2008 [11] (PMCT in general has been used since the 1980s [1,2]). In contrast, due to PMCTA being a more recent development, arising only in the last decade [2], it makes sense that prosecutors, like the general population, would not be familiar with it.

However, almost all provided advantages of PMCT – whether true or not – were more frequently chosen by the Polish general public than by prosecutors. These results indicate that prosecutors have been underinformed in regard to PMCT and its uses, which can cause undervaluation of situations in which such an examination would provide a significant advantage to the post-mortem examination as a whole, such as in mass catastrophes [9, 17-20] or when evaluating skeletal structures [15, 16] after traumatic accidents [7, 21], etc. On the other hand, the same knowledge gap may cause their unawareness of the pitfalls of PMCT – e.g. that it is less accurate than traditional autopsy in assessing bruises and contusions, that it does not always allow for unequivocal determination of cause of death, or that it does not eliminate the need for additional testing. Providing this missing knowledge to prosecutors could significantly and positively influence the decision to refer to PMCT as part of the post-mortem examination proper.

The majority of prosecutors still held fast to the opinion that traditional autopsy is the gold standard in post-mortem diagnosis, and that it should not be completely replaced – but, due to its own pitfalls, should be used in tandem with PMCT. Thus, the general consensus was that PMCT is an excellent supplemental examination. A further indication of prosecutors' positive opinion of this imaging technique was the result that somewhat more than half of survey respondents indicated that the cost of performing a PMCT examination would not change whether or not they wanted one performed.

On another positive note, their belief in PMCT's numerous advantages may indicate that Polish society at large also has an optimistic outlook on the potential of the examination, and this idea is further compounded by larger percentages answering that they would like a traditional autopsy and PMCT or just PMCT ordered in the case of a deceased loved one, that they would still like to choose additional PMCT even if a traditional autopsy has already been ordered, and that most would like the option of performing PMCT at their own cost if prosecutors deemed a traditional autopsy unnecessary. Both the majority of prosecutors and the general public were interested in learning more about this imaging technique. All this retroactively provides weight to the truth of the statement "PMCT is more socially acceptable than traditional autopsy".

Ultimately, this study shows that prosecutors in Poland have had more contact with PMCT than the public, but that their knowledge on the topic is similar to that of a person who is not a prosecutor. This information gap is crucial to be filled, and shows the need to organize more courses and training about PMCT for the Polish prosecution. These courses should underline the advantages and limitations of PMCT, as well as which types of cases would benefit from this imaging technique (and which would not). Despite some financial concerns, the desire to learn more has been indicated, and with contemporaneous positive social sentiment towards PMCT, the growth of using this imaging technique and its variations, such as PMCTA, appears as if it will continue into the near future.

Despite the fact that the present study was conducted in 2019, the authors believe that it holds significant value, and, as to the best of the authors' knowledge, it is the first in Poland to tackle this topic. Moreover, the authors were unable to find similar studies conducted in international publications. The state of forensic radiology in Poland has not significantly changed over the last few years in a way that would indicate that the data gathered in this study is out-of-date. The authors failed to find information regarding any publically available, popular media campaigns about PMCT in Poland which would have changed the knowledge of the general public regarding this examination. Likewise, there appears to be no solid ground to believe that prosecutor's knowledge and perception of PMCT has changed within the last few years. As of 2023, there are still only three places in Poland which have a practical possibility of performing such a post-mortem examination. The authors to this date have further not been able to find any information regarding any courses and training about PMCT for the Polish prosecution specifically recommended by the National Prosecutor's Office, which may have changed the attitudes and understanding of individual prosecutors between 2019 and now. Moreover, PMCT continues to be ignored on a legal level – in 2023, there are still no regulations regarding its usage, unlike the procedures governing autopsies [10].



Taking all the above into account, the present authors are of the belief that this study is a good starting point for future research in this area of interest. There exists potential for conducting a multicentre study of a similar nature – whether in Poland or even internationally – which could provide useful information about the regional similarities and differences of the knowledge and attitudes of prosecutors and the general population.

### Limitations

As it was mentioned in the previous section, the present study was conducted in 2019. Statistics revealed that approximately half of the respondents to the general population survey were directly associated with or had a family member associated with medicine. A more varied selection of the general population is indicated in the case of future repeat studies of a similar methodology.

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