



Original communication

## Forensic investigation of suicide cases in major Greek correctional facilities



E.I. Sakelliadis, MD, MSc, Scientific Associate\*,  
D.G. Vlachodimitropoulos, MD, PhD, Assistant Professor,  
N.D. Goutas, MD, PhD, Assistant Professor, P.I. Panousi, JD, MSc, Post Graduate Student,  
A.-P.I. Logiopoulou, RN, MSc, Post Graduate Student,  
E.M. Delicha, BSc(MATH), MSc, Scientific Associate,  
C.A. Spiliopoulou, MD, PhD, Professor, Head of Department

Department of Forensic Medicine & Toxicology, Medical Faculty, National & Kapodistrian University of Athens, Mikras Asias 75, Goudi, 11527 Athens, Greece

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### ABSTRACT

**Introduction:** According to Greek legislation the medico-legal investigation of deaths occurring in prisons is mandatory. Furthermore, in cases of suicide or of suspected suicide the contribution of medico-legal investigation is of grave importance. The current paper addresses the medico-legal investigation of suicide cases in Greek correctional facilities and aims to describe the current situation.

**Materials & methods:** Our study consists of the meticulous research in the data records of major Greek correctional facilities, for the time period 1999–2010. Official permission was obtained by the Hellenic Ministry of Justice, which provided us the access to the records. Data was also collected from the Piraeus Forensic Service, from the Department of Pathological Anatomy of the University of Athens and finally from our own records. Measures were taken to respect the anonymity of the cases. Data was collected for the social, penal, medical history as well as for the medico-legal investigation.

**Results–conclusions:** It appears that 85.7% of suicide cases were transferred to the Prisoner's Hospital ( $p < 0.0001$ ), the forensic pathologist who conducted the PME did not perform scene investigation in none of the 70 suicide cases. In a total of 70 cases, histopathological examination, was requested only in 30 cases (42.9%). Hanging was the preferred method for those who committed suicide, followed by the poisoning due to psychoactive substances.

Understanding the mistakes made during the forensic investigation of suicide cases inside correctional facilities is necessary, in order to prevent them from occurring again in the future, by implementing appropriate new policies and guidelines.

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### 1. Introduction

Mortality data can provide valuable information on health issues that inmates bring to a jail system. By comparing mortality rates between the jail population and the general population, inmates' unique needs and health risks can be highlighted and thus more efficiently dealt with.<sup>1</sup>

According to the Greek Correctional Code, all deaths of prisoners should be investigated by medico-legal examination.<sup>2</sup>

The above-mentioned provision of the Greek Legislation, is in contradiction with the widely accepted opinion that autopsy is performed primarily to identify unnatural and violent death.<sup>3</sup>

On the other hand, according to the National Association of Medical Examiners, medico-legal investigations aim to determine among others, the cause and the manner of death, of persons in custody.<sup>4</sup>

Furthermore, according to the Recommendation No. R (99) 3, of the Committee of Ministers of the Council of Europe: "autopsies should be carried out in all obvious or suspected unnatural death, even when there is a delay between causative event and death". The above-mentioned recommendation includes cases of homicide or suspected homicide, (E.I. Sakelliadis, cases of violation of human rights, such as

\* Corresponding author. Arachovis 20, 10680 Athens, Greece. Tel.: +30 210 3633477, +30 6945 491320 (mobile); fax: +30 210 3633419.

E-mail address: [eisakelliadis@forensicadvice.gr](mailto:eisakelliadis@forensicadvice.gr) (E.I. Sakelliadis).

**Table 1**  
Baseline characteristics of study by suicide (yes/no).

		Suicide		p-Value
		Yes	No	
		N	N	
		%	%	
Gender	Male	68	185	0.663
		26.9%	73.1%	
	Female	2	4	0.004
		33.3%	66.7%	
Nationality	Eastern Europe	13	13	0.004
		50.0%	50.0%	
	Asia	9	10	0.003
		47.4%	52.6%	
	Africa	1	7	<0.0001
		12.5%	87.5%	
	Western Europe	4	6	0.008
		40.0%	60.0%	
Profession	Greek	43	153	0.003
		21.9%	78.1%	
	Blue collar	51	124	0.003
		29.1%	70.9%	
	White collar	8	53	<0.0001
		13.1%	86.9%	
Family Status	Unemployed	11	12	0.008
		47.8%	52.2%	
	Single	36	48	<0.0001
		42.9%	57.1%	
	Divorced	7	36	0.008
		16.3%	83.7%	
	Married	25	83	0.008
		23.1%	76.9%	
	Widow	2	21	0.008
		8.7%	91.3%	
Children	Yes	27	100	0.008
		21.3%	78.7%	
	No	41	67	0.008
		38.0%	62.0%	
Education	Illiterate	8	17	0.008
		32.0%	68.0%	
	<6 yrs	19	77	0.065
		19.8%	80.2%	
	<9 yrs	19	37	0.065
		33.9%	66.1%	
	<12 yrs	14	14	0.065
		50.0%	50.0%	
	<14 yrs	4	12	0.065
		25.0%	75.0%	
	>14 yrs	2	21	0.065
		8.7%	91.3%	
Number of imprisonments	1	60	157	0.065
		27.6%	72.4%	
	2	7	9	0.042
		43.8%	56.3%	
	3	3	23	0.042
		11.5%	88.5%	
History of drug abuse	Yes	18	28	0.042
		39.1%	60.9%	
	No	52	161	<0.0001
		24.4%	75.6%	
Receiving pharmaceutical treatment	Yes	28	42	<0.0001
		40.0%	60.0%	
	No	134	55	0.037
		70.9%	29.1%	
Psychiatric disorder	Yes	18	75	0.037
		19.4%	80.6%	
	No	52	114	0.037
		31.3%	68.7%	

suspicion of torture or any other form of ill treatment and finally cases of suicide or suspected suicide.<sup>5</sup>

According to the same Recommendation, “particularly in cases of homicide or suspicious death, medico-legal experts should be informed

**Table 2**  
Age of first imprisonment, death by suicide.

	Suicide	N	Mean	95% CI	Min	Max	p-Value	
Age of 1st imprisonment (yrs)	No	189	51.3	49.2	53.4	19.0	83.0	<0.0001
	Yes	70	34.0	31.4	36.7	15.0	68.0	
Age of death (yrs)	No	189	55.1	52.9	57.3	19.5	87.7	<0.0001
	Yes	70	35.8	33.2	38.4	15.2	68.6	
Months from imprisonment to death	No	189	43.1	32.5	53.6	0.00	565.0	0.009
	Yes	70	19.2	12.1	26.3	0.10	159.3	

without delay and, where appropriate, go immediately to the place where the body is found and have immediate access there”.

Furthermore, the above-mentioned Recommendation states that the medico-legal expert should be informed of all relevant circumstances relating to the death, ensure that photographs of the body are properly taken, record the body position and its relation to the state of clothing and to the distribution pattern of rigor mortis and hypostasis, examine and record the distribution and pattern of any blood stains on the body and at the scene, proceed to a preliminary examination of the body, note the ambient temperature and deep-rectal temperature of the body and finally make sure that the body is transported and stored in a secure and refrigerated location in an undisturbed state.

In line with the Greek Legislation, the necessity of the scene investigation by the forensic pathologist, is evaluated separately by the Authority demanding the post-mortem examination (PME).

## 2. Materials & methods

Our study consists of the meticulous research in the data records of major Greek correctional facilities, for the time period 1999–2010. Official permission was authorized by the Hellenic Ministry of Justice, giving us access to these restricted records. Data was also collected from the Piraeus Forensic Service, from the Department of Pathological Anatomy of the University of Athens and finally from our own records. Measures were taken to respect the anonymity of the cases. Data was collected for the social, penal, medical history as well as for the medico-legal investigation.

For purposes of statistical analysis, crimes were classified according to the Hellenic Penal Code,<sup>6</sup> pharmaceutical agents were classified according to the anatomical therapeutic chemical (ATC)<sup>7</sup> system and finally diseases were classified according to the International Classification of Diseases, (ICD-10).<sup>8</sup>

**Table 3**  
Findings during PME, indicating prompt discovery of incident.

Findings indicating prompt discovery of incident	Suicide		p-Value	
	Yes	No		
		N	N	
		%	%	
Transferred to Prisoner's Hospital		60	81	<0.0001
		85.7%	42.9%	
Transferred to civilian hospital		2	13	NS
		2.9%	6.9%	
Defibrillation marks		2	9	NS
		2.9%	4.8%	
EKG electrodes		3	14	NS
		4.3%	7.5%	
Needle punctures		10	66	0.002
		14.3%	35.3%	

**Table 4**  
Main findings during external PME of 70 suicide cases.

PME-external examination	Suicide		p-Value
	Yes	No	
	N	N	
	%	%	
Facial cyanosis	8 11.4%	6 3.2%	0.023
Nail cyanosis	24 34.3%	62 33.2%	NS
Tardieu spots	28 40.0%	25 13.4%	<0.0001
Tatoos	26 37.1%	35 18.7%	0.003
Abrasions	25 35.7%	24 12.8%	<0.0001
Needle punctures	10 14.3%	66 35.3%	0.002

**Table 5**  
Main findings during internal PME of 70 suicide cases.

PME-internal examination	Suicide		p-Value
	Yes	No	
	N	N	
	%	%	
Old myocardial infarction	1 1.4%	28 15.0%	0.001
Aorta dilatation	1 1.4%	27 14.4%	0.001
Degree of coronary stenosis	0% 46 66.7%	67 36.4%	<0.0001
	<30% 13 18.8%	15 8.2%	
	<60% 8 11.6%	45 24.5%	
	<80% 1 1.4%	23 12.5%	
	≥80% 1 1.4%	34 18.5%	
Atheromatosis of circle of Willis	2 2.9%	56 29.9%	<0.0001
Pulmonary edema	45 64.3%	129 69.0%	NS
Pulmonary hemorrhage	7 10.0%	6 3.2%	0.058
Pulmonary tardieu spots	10 14.3%	4 2.1%	0.001

Statistical analysis was performed with SPSS v18.0 statistical software (IBM). Possible differences of baseline characteristics between suicide victims and the rest of the population study were investigated by chi-square statistic, whereas one way analysis of variance was employed to test the respective distributional differences of age, age of death and duration of imprisoning.

**3. Results**

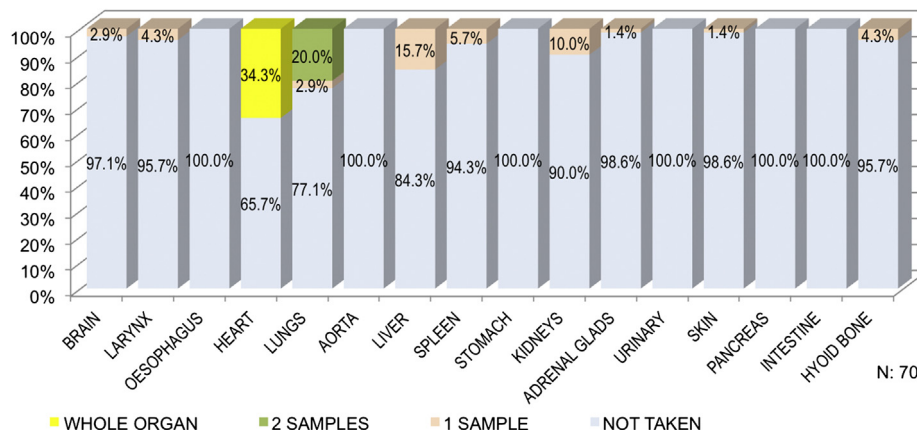
The total number of suicides within the specific time period examined, is 70 out of 259 cases of death inside the examined correctional facilities (suicide frequency 27%). The baseline characteristics of our study are summarized in Table 1. It is evident that those who commit suicide are significantly more of Eastern European & Asiatic origin as compared to all other origins ( $p = 0.004$ ), unemployed as compared to regular workers ( $p = 0.003$ ), single as compared to other family status ( $p < 0.0001$ ) without children ( $p = 0.008$ ) as compared to those who have children. Those who tend to commit suicide less frequently, compared to other prisoners, are university graduates ( $p = 0.008$ ) and the mentally ill ( $p = 0.037$ ).

Furthermore, it appears than prisoners who have a history of drug abuse are more likely to commit suicide compared to those who do not ( $p = 0.042$ ) (Table 1). Finally, those prisoners who do not receive any pharmaceutical treatment appear to be more prone to suicide compared to those who receive treatment ( $p < 0.0001$ ) (Table 1).

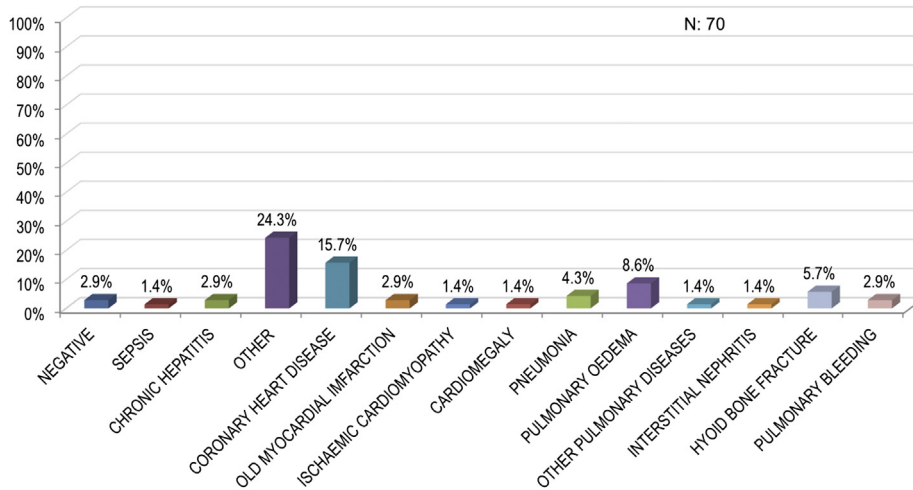
It appears that those who have been imprisoned two times tend to commit suicide more often compared to those who are imprisoned one or three times, but we must note that this finding is statistically of borderline significance ( $p = 0.065$ ). From the statistical analysis it is quite evident (Table 2) that the prisoners who actually commit suicide are imprisoned for the first time at a younger age (34 years) compared to those prisoners who don't commit suicide (51.3 years). Naturally the age of death for those who commit suicide (35.8 years) is smaller than for those who don't (55.1 years) (Table 2). According to our results the mean time interval between the first imprisonment and the death for those who commit suicide (19.2 months) is smaller than for those who don't (43.1 months) (Table 2).

According to the data collected, the forensic pathologist who conducted the PME, did not perform scene investigation in none of the 70 suicide cases.

From our data it appears that 85.7% of suicide cases were transferred to the Prisoner's Hospital ( $p < 0.0001$ ) as compared to other death cases. This can be explained, either because they were



**Graph 1.** Pathology sampling for suicide cases.



Graph 2. Results of histopathology, in suicide cases.

Table 6  
Sampling for toxicological examination.

Toxicology sampling		Suicide		
		Yes	No	
		N	N	
		%	%	
Blood	Yes	63	123	$p = 0.022$
	No	5	1	
		7.4%	0.8%	
Urine	Yes	40	48	$p = 0.012$
	No	28	76	
		41.2%	61.3%	

discovered in time thus permitting a resuscitation, or because they were transferred there, simply to ascertain death.

Furthermore the other parameters such as transfer to a civilian hospital, defibrillation marks, EKG electrodes on the chest or even needle punctures ( $p = 0.002$ ), appear to be less frequent in suicide cases, compared to other death cases. This suggests that the transfer to the Prisoner’s Hospital was rather a formality followed by the prison staff, than an attempt to save lives (Table 3).

The main findings during the external PME (Table 4), such as, facial cyanosis ( $p = 0.023$ ), tardieu spots ( $p < 0.0001$ ), tattoos ( $p < 0.0001$ ) are more frequently observed in suicide cases, compared to prisoner’s death of other nature.

The main findings during the internal PME (Table 5), such as old myocardial infarction ( $p = 0.001$ ), aorta dilatation ( $p = 0.001$ ), absence

of coronary stenosis ( $p < 0.0001$ ), or even the atheromatosis of the vessels of the circle of Willis ( $p < 0.0001$ ), appear to be less frequent in suicide cases, compared to prisoner’s death of other nature.

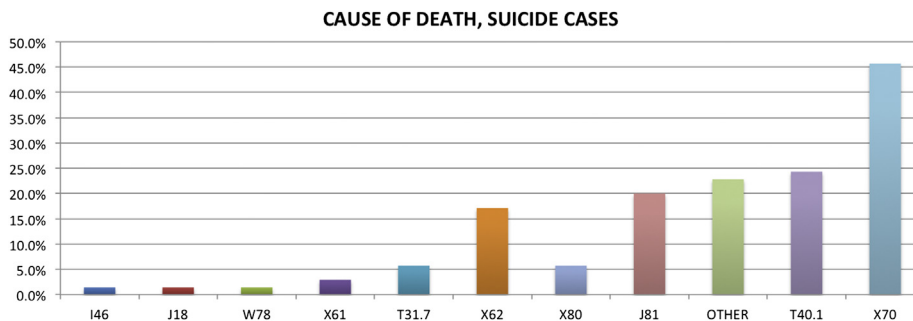
In a total of 70 cases, histopathological examination, was requested only in 30 cases (42.9%). It appears that the heart when sampled for histopathology, is sampled as a whole organ, while the usual routine for the lungs is the sampling of 2 tissue samples. The results of the sampling for histopathological examination are shown in Graph 1.

According to the study of the results of the histopathological examination, it appears the coronary heart disease and pulmonary edema are the most frequent histopathological diagnosis (Graph 2).

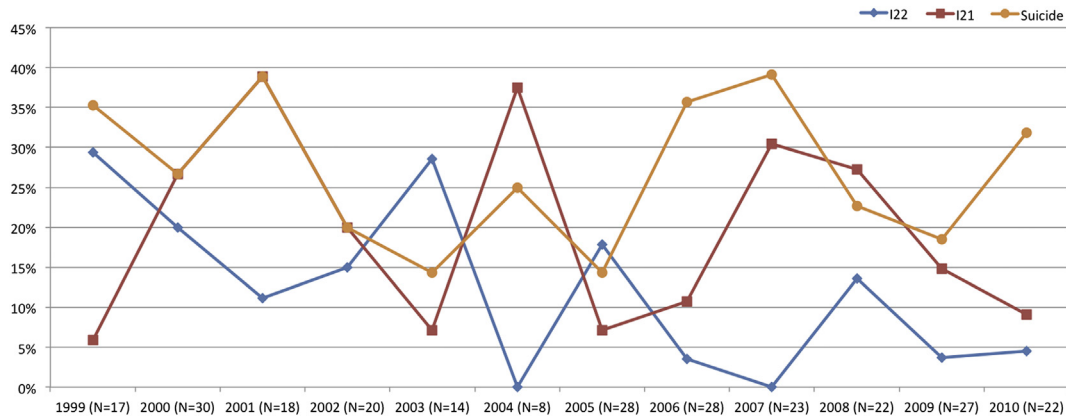
The sampling for toxicological examination (Table 6), was mainly focused in blood samples ( $p = 0.022$ ), rather than urine samples ( $p = 0.012$ ).

The distribution of the causes of death in the 70 suicide cases, is illustrated in Graph 3, from which we can conclude that hanging (X70), was the preferred method for those who committed suicide, followed by poisoning by use of psychoactive substances. Surprisingly, pulmonary edema (J81), represents 20% of the causes of death in suicide cases. This is quite irregular, as pulmonary edema does not represent a histopathological diagnosis and is present nearly in all not instantaneous deaths.

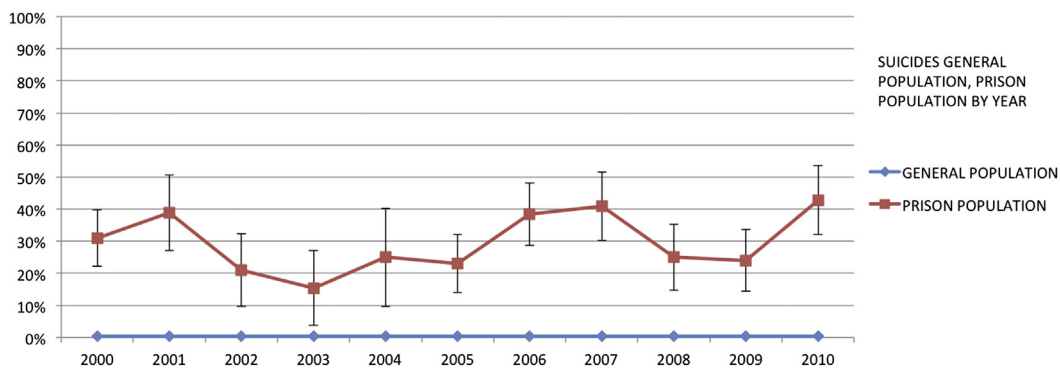
The number of suicide cases per year, compared with other causes of death (AMI, old infarction), is illustrated in Graph 4. In Graph 5, a comparison is made for suicide cases in the prisoner population sampled and in the general population (source: EL.STAT.). It is clear that the suicide cases show a brief decrease, during the year 2002–2005 and 2008–2009. Since the year 2010,



Graph 3. Cause of death in suicide cases.



Graph 4. AMI, Old MI, suicide by year.



Graph 5. Suicide in prison and in general population, by year.

which is the last year of our study, there is an increase crucial to be analyzed in the future, in order to ascertain its possible causes.

#### 4. Discussion

The principle that prisoners are entitled to the same level of health care as that provided in the wider community is vastly accepted in tolerant societies and modern prison systems.<sup>9</sup> It is exactly this principle that makes our effort to understand the profile of the suicide victims inside correctional facilities.

In the past, several factors have been suggested as predisposing to increased suicide risk. Among those factors are: self-injurious behavior,<sup>10</sup> previous psychiatric disorder,<sup>11</sup> young age,<sup>12</sup> history of substance use,<sup>13</sup> personal and family variables (e.g. previous or current convictions for violent criminal offenses, dysfunctional families, etc.)<sup>14</sup> and finally the initial days after incarceration.<sup>15–17</sup>

Reports by Salive et al.,<sup>18</sup> Copeland<sup>19</sup> and Lanphear<sup>20</sup> demonstrated that natural disease processes were the leading cause of death of persons inside correctional facilities. According to Fazel et al.,<sup>21</sup> the main subcategory of natural cause of death, is the one comprising all the diseases of the circulatory system.

On the other hand, numerous studies report suicide being the leading cause of death.<sup>22</sup> Among others, Way et al.,<sup>23</sup> cites suicide, to be the first cause of death among inmates. According to Dooley,<sup>24</sup> suicide inside correctional facilities can be as 10–20 times more frequent than homicide deaths. In addition, self-inflicted deaths can represent as high as one third of inmate deaths worldwide.<sup>25</sup>

Finally, according to Spinellis et al.,<sup>26</sup> suicide is the leading cause of death in Greek correctional facilities. Most incidents took place inside the Prisoner's Psychiatric Hospital and inside

Prisoner's Hospitals in general. In all, suicide among prisoners is considered to occur more frequently, compared to the general Greek population.

In general one must keep in mind that Coroners' records are an accessible source of information on suicides. The use of standardized forms by coroners would assist studies of factors associated with suicide and potentially provide a representative source of information relevant to suicide prevention.<sup>27</sup>

Understanding the social profile of possible suicide victims, is actually the first step in the direction of prevention inside correctional facilities and should be promptly evaluated by the relevant authorities.<sup>28</sup>

#### 5. Conclusions

Understanding the mistakes made during the forensic investigation of suicide cases inside correctional facilities is necessary, in order to prevent them by implementing appropriate guidelines and policies. Scene investigation conducted by the forensic pathologist in charge of the subsequent PME, is deemed crucial and should be encouraged in all suicide cases. A more careful approach is required with regard to the sampling for both histopathological and toxicological examination as well as determination of the final cause of death.

#### Ethical approval

None.

#### Funding

None.

### Conflict of interest

We declare that there is no conflict of interest concerning our paper.

### References

- Kim S, Ting A, Puisis M, Rodriguez S, Benson R, Mennella C, et al. Deaths in the Cook County jail: 10-year report, 1995–2004. *J Urban Health – Bull New York Acad Med* 2007;**84**(1):70–84 [Epub 2006/12/01].
- Law 2776/1999, article 80.
- RCP. *Guidelines on autopsy practice 2002*. Available from: <http://www.rcpath.org/publications-media/publications/guidelines-on-autopsy-practice>; September 2012.
- NAME. *Forensic autopsy performance standards 2005*. Available from: [http://thename.org/index2.php?option=com\\_docman%26task=doc\\_view%26gid=160%26Itemid=26](http://thename.org/index2.php?option=com_docman%26task=doc_view%26gid=160%26Itemid=26); September 2012.
- Recommendation No. R (99) 3 on the harmonisation of medico-legal autopsy rules*, R (99) 3; 1999.
- Law, The Hellenic Parliament.
- Methodology WCCfDS. *The anatomical therapeutic chemical classification system with defined daily doses (ATC/DDD)*. WHO; 2003 [updated 2003; cited 2012. 20-6-2012]. Available from: <http://www.who.int/classifications/atcddd/en/>.
- WHO. *International classification of diseases (ICD)* [cited 2012. 20-5-2012]. Available from: <http://www.who.int/classifications/icd/en/>; 2010.
- Sakelliadis EI, Spiliopoulou CA, Papadodima SA. Health care provision in prisons: a review on European and international guidelines. *Acta Clinica Belgica* 2009;**64**:399–405.
- Sakelliadis EI, Papadodima SA, Sergeantanis TN, Giotakos O, Spiliopoulou CA. Self-injurious behavior among Greek male prisoners: prevalence and risk factors. *Eur Psychiatry – J Assoc Eur Psychiatr* 2010;**25**:151–8.
- Baillargeon J, Penn JV, Thomas CR, Temple JR, Baillargeon G, Murray OJ. Psychiatric disorders and suicide in the nation's largest state prison system. *J Am Acad Psychiatry Law* 2009;**37**:188–93.
- Bird SM. Changes in male suicides in Scottish prisons: 10-year study. *Br J Psychiatry – J Ment Sci* 2008;**192**:446–9.
- Palacio C, Garcia J, Diago J, Zapata C, Lopez G, Ortiz J, et al. Identification of suicide risk factors in Medellin, Colombia: a case-control study of psychological autopsy in a developing country. *Arch Suicide Res – Off J Int Acad Suicide Res* 2007;**11**:297–308.
- Camilleri P, McArthur M. Suicidal behaviour in prisons: learning from Australian and international experiences. *Int J Law Psychiatry* 2008;**31**:297–307.
- Backett SA. Suicide in Scottish prisons. *Br J Psychiatry – J Ment Sci* 1987;**151**:218–21.
- Dooley E. Prison suicide in England and Wales, 1972–87. *Br J Psychiatry – J Ment Sci* 1990;**156**:40–5.
- DuRand CJ, Burtka CJ, Federman EJ, Haycox JA, Smith JW. A quarter century of suicide in a major urban jail: implications for community psychiatry. *Am J Psychiatry* 1995;**152**:1077–80.
- Salive ME, Smith GS, Brewer TF. Death in prison: changing mortality patterns among male prisoners in Maryland, 1979–87. *Am J Public Health* 1990;**80**(12):1479–80 [Epub 1990/12/01].
- Copeland AR. Deaths in custody revisited. *Am J Forensic Med Pathol* 1984;**5**(2):121–4 [Epub 1984/06/01].
- Lanphear BP. Deaths in custody in Shelby County, Tennessee, January 1970–July 1985. *Am J Forensic Med Pathol* 1987;**8**(4):299–301 [Epub 1987/12/01].
- Fazel S, Benning R. Natural deaths in male prisoners: a 20-year mortality study. *Eur J Public Health* 2006;**16**(4):441–4 [Epub 2006/01/25].
- Koehler SA, Weiss H, Songer TJ, Rozin L, Shakir A, Ladham S, et al. Deaths among criminal suspects, law enforcement officers, civilians, and prison inmates: a coroner-based study. *Am J Forensic Med Pathol* 2003;**24**(4):334–8 [Epub 2003/11/25].
- Way BB, Miraglia R, Sawyer DA, Beer R, Eddy J. Factors related to suicide in New York state prisons. *Int J Law Psychiatry* 2005;**28**(3):207–21 [Epub 2005/06/14].
- Dooley E. Unnatural deaths in prison. *Brit J Criminol* 1990;**30**(2):229–34.
- Kariminia A, Law MG, Butler TG, Corben SP, Levy MH, Kaldor JM, et al. Factors associated with mortality in a cohort of Australian prisoners. *Eur J Epidemiol* 2007;**22**(7):417–28 [Epub 2007/08/02].
- Spinellis CD, Themeli O. Suicide in Greek prisons: 1977 to 1996. *Crisis* 1997;**18**(4):152–6 [Epub 1997/01/01].
- Bennewith O, Hawton K, Simkin S, Sutton L, Kapur N, Turnbull P, et al. The usefulness of coroners' data on suicides for providing information relevant to prevention. *Suicide Life-threatening Behav* 2005;**35**:607–14.
- Sakelliadis EI, Goutas ND, Vlachomitropoulos DG, Logiopolou A-PI, Panousi PI, Delicha EM, et al. The social profile of victims of suicide in major Greek correctional facilities. *J Forensic Leg Med* 2013;**20**(6):711–4.