

Original Article

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Abstract

Objective. Hemato-oncologists are highly exposed to patients' death and suffering during their daily work. The current exploratory and cross-sectional study examined death acceptance attitudes, in order to explore whether death acceptance attitudes are associated with fear of death.

Method. A convenience sample of 50 Israeli hemato-oncologists currently working in a clinical setting participated in the study. They completed the Death Attitudes Profile revised questionnaire (DAP-R), which examines levels of fear of death, death avoidance, approach acceptance, neutral acceptance, and escape acceptance. In addition, the hemato-oncologists reported on levels of exposure to patients' death and suffering.

Results. A repeated measures MANOVA revealed significantly lower levels of neutral acceptance, compared with approach and escape acceptance. Path analysis for predicting fear of death by the other study variables revealed that death avoidance fully mediated the relationship between approach acceptance and fear of death as well as revealing a negative correlation between neutral acceptance and fear of death (higher neutral acceptance was related to lower fear of death). No associations were found between exposure to death and suffering and attitudes toward death.

Significance of results. In contrast to previous conceptualizations, the ability to adaptively cope with fear of death differed in accordance with death acceptance attitudes. Whereas neutral acceptance adaptively defended from fear of death, approach acceptance was associated with increased fear of death through death avoidance. As hemato-oncologists are highly exposed to patients' death and suffering, and are required to make critical medical decisions on daily basis, these findings may have substantial implications for end-of-life care and the process of medical decision-making regarding the choice of treatment goals: cure, quality of life, and life prolongment. Further research is needed to investigate the role of death acceptance attitudes among hemato-oncologists.

Introduction

Caring for dying patients is considered to be the most difficult part of medical care (Baile et al., 2002; Eid et al., 2009) and is known to be a significant part of hemato-oncologists' role. Hemato-oncologists are frequently exposed to death and dying, and their work requires them to make daily complex medical decisions that have crucial implications for patients' lives and deaths. In this regard, research shows that in comparison with solid tumor patients, patients with hematologic malignancies receive less palliative care (LeBlanc et al., 2015), more frequently die in the hospital or ICU unit (Howell et al., 2015) and are more likely to undergo aggressive treatments in the last weeks of their lives (Hui et al., 2014).

It has been established that physician exposure to patient death and suffering leads to distress and vulnerability (Aase et al., 2008; Whitehead, 2014). One explanation is that the encounter with death serves as mortality salience. In other words, it highlights the presence of death, reminding hemato-oncologists of their own mortality (Abeyta et al., 2014; French et al., 2017). As a result of this encounter, a variety of attitudes toward death and dying may surface, ranging from fear to acceptance (Tomer et al., 2007).

Death acceptance is defined as one's psychological readiness to separate from life (Wong et al., 1994). It consists of two components: cognitive awareness of the idea of mortality and a neutral-to-positive emotional reaction to the notion (Klug and Sinha, 1987). In theory, accepting death can liberate humans from fear and anxiety of death, and lead them toward living their lives with purpose (Wong and Tomer, 2011). Consequently, death acceptance is considered to be a positive attitude toward death (Tomer et al., 2007). In other words, a positive attitude toward death may be conceptualized as a coping mechanism when one is exposed to death, as hemato-oncologists are when caring for dying patients.

Unlike previous conceptualizations, Gesser et al. (1987) referred to death acceptance not as a monolithic concept, but rather as a complex construct divided into three dimensions:

neutral, approach, and escape acceptance. Neutral acceptance views death as an integral part of life, a part that is not feared but also not welcomed. Approach acceptance is an attitude that views death as a passage to a happy afterlife (Dixon and Kinlaw, 1983). The third, escape acceptance, is when death is perceived as a better alternative to a life full of pain and suffering (Wong et al., 1994).

Along with death acceptance, Wong et al. (1994) in their multidimensional model of attitudes toward death referred to fear of death and death avoidance. Fear of death refers to a specific and conscious fear of death and dying. Examples include fear of loss of self, fear of uncertainty about the afterlife, fear of pain and suffering, fear of loss of opportunities for atonement, and fear for the welfare of surviving family members. Death avoidance is a way of coping via regulating and reducing death anxiety, attained by the avoidance of thinking or talking about death (Wong et al., 1994). Wong et al. (1994) developed the Death Attitude Profile Revised (DAP-R), a multidimensional measure of attitudes toward death, which examines three dimensions: fear of death, death avoidance, and death acceptance. This classification enables an examination of possible associations between the different dimensions. One interesting possibility is the consideration of death acceptance as a strategy to cope with fear of death (Wong and Tomer, 2011).

Previous research has shown that physicians' attitudes toward death can influence their professional behaviors. Black (2007) examined attitudes toward death among healthcare professionals, including physicians who primarily work with the geriatric patients. The research found negative correlations between advance directive communication behaviors and fear of death, death avoidance, and escape acceptance, as well as a positive correlation between approach acceptance and initiating the discussion of advanced directives. A qualitative study examined the relationship between attitudes toward death and communicating with terminally ill patients, concluded that oncologists' awareness of their own mortality might facilitate open discussions about death and the provision of better care for dying patients (Rodenbach et al., 2016). Draper et al. (2019) found that death anxiety among physicians created difficulty in engaging in end-of-life communication and decision making. If this is in fact the case, different attitudes toward death may correspond with varied aspects of the medical care provided by hemato-oncologists.

Until now, most of the research in this area has focused on investigating the role of negative attitudes toward death among physicians (Niemeyer et al., 2004; Draper et al., 2019). The current preliminary and exploratory study, however, intends to generate a more comprehensive picture. Exploring the possible links and patterns between distinct attitudes toward death of hemato-oncologists, a population that has scarcely been researched to date, may lead to a better understanding of physicians' positions when caring for dying patients, which in turn may have implications for end-of-life medical treatment and decision making.

The current study aimed to explore associations between different attitudes toward death among hemato-oncologists. We hypothesized that there would be negative associations between the various dimensions of death acceptance and fear of death, so that higher death acceptance would be associated with lower fear of death. In addition, we hypothesized that there would be a mediating role of death avoidance in the relation between death acceptance dimensions and fear of death. This hypothesis

was based on the conceptualization of death avoidance as a coping mechanism when encountering the fear of death (Wong et al., 1994), and the use of this defense mechanism by hemato-oncologists to repress frightening thoughts about death and feelings of vulnerability (Furer and Walker, 2008).

Methods

Participants and procedures

Participants were recruited at the October 2018 annual conference of the Israel Society of Hematology and Blood Transfusion. All participants signed informed consent and filled out the questionnaires via Qualtrics®, using their smartphones or computers. In order to encourage participation, a lottery ticket was offered as an incentive. This study received approval (number 2018164) from the institutional review board (IRB) of The Academic College of Tel Aviv-Yaffo. Fifty-eight hemato-oncologists participated. However, eight questionnaires were excluded due to missing data, leaving a total of 50 participants. Although the sample size was small, this procedure enabled us to recruit a convenience sample of more than a third of all the hemato-oncologists who currently work in a clinical setting in Israel.

The mean age was 47.82 (SD = 8.2, range 32–68), and participants were divided equally by gender. Most of the sample were Jewish (94%), married (84%), and secular (72%). In addition, most were specialists (90%), who worked in full-time positions (84%), in hospitals (96%) with a mean of 13 years of experience (SD = 8.08, range 1–32). The participants reported that on average, 38% of their patients eventually died from their disease. Twenty-nine percent of their patients suffered from medium-to-severe physical pain most of the time, and more than half of them suffered from significant mental suffering most of the time (52.9%).

Measures

The *Death Attitudes Profile Revised (DAP-R)* is a 32-item, 7-point Likert-type scale, that assesses attitudes toward death (Wong et al., 1994). Items represent five subscales: *Fear of death* (seven items) measures the respondents' negative thoughts and feelings toward death and the process of dying (e.g., "Death is no doubt a grim experience"). *Death avoidance* (five items) measures the attempt to avoid thoughts about death (e.g., "I always try not to think about death"). *Escape acceptance* (five items) measures the extent to which a person views death as a deliverance from a life full of pain and suffering (e.g., "I see death as a relief from the burden of life"). *Neutral acceptance* (five items) measures the extent to which a person views death as a reality, as a natural part of life that is neither feared nor welcomed (e.g., "Death is simply a part of the process of life"). Finally, *approach acceptance* (ten items) measures viewing death as an entryway to a better life, meaning the afterlife (e.g., "Death brings a promise of a new and glorious life"). Each subscale is scored by the mean of its items. In the current study, all subscale reliabilities as measured by Cronbach's alpha were found to be acceptable: Fear of death (0.82), death avoidance (0.94), neutral acceptance (0.61), approach acceptance (0.93), and escape acceptance (0.83).

A demographic questionnaire elicited socio-demographic information (e.g., age, gender, and family status), as well as professional information (e.g., specialty and years of experience). Finally, the questionnaire included profession-related questions

regarding hemato-oncologists' exposure to patients' suffering and death. Participants were asked to estimate the percentages (from 0 to 100%) of their patients who died from the disease, and the percentages of their patients who suffered from moderate-to-severe physical and/or mental pain during a significant portion of the time.

Statistical analysis

All data were coded and analyzed using Statistical Package for the Social Sciences, version 25 (SPSS, Chicago, IL). Descriptive statistics (e.g., means, standard deviations, and frequencies) was calculated for all study variables. A repeated measures MANOVA was conducted to examine differences between levels of the various death acceptance attitudes. Pearson correlation coefficients were calculated in order to assess associations between demographic variables and attitudes toward death, as well as associations between the subscales of the attitudes toward death. Finally, to examine the main study hypothesis predicting death avoidance as a mediator between death acceptance and fear of death, path analysis was conducted using AMOS software (Arbuckle, 2017).

Results

Attitudes toward death

Descriptive statistics (means and standard deviations) of the hemato-oncologist's attitudes toward death are presented in Table 1. Participants reported moderate levels of fear of death (close to the middle of the scale), and a moderate-to-high level of death avoidance and approach acceptance (higher than the middle of the scale). A repeated measures MANOVA showed that death acceptance attitudes differed significantly, $F(2,98) = 88.62$, $P < 0.001$, partial $\eta^2 = 0.64$. *Post hoc* tests using the Bonferroni correction revealed that the neutral acceptance mean was lower by 2.89 ($P < 0.05$) than the approach acceptance mean, and lower by 2.36 ($P < 0.05$) than the escape acceptance mean.

Correlations

Death avoidance was the only variable significantly associated with demographic variables: Specifically, it was negatively correlated with participants' age and years of experience ($r = -0.317$, $P = 0.025$; $r = -0.374$, $P = 0.009$, respectively). Older hemato-oncologists with more years of experience reported lower levels of fear of death. No associations were found between exposure to death and suffering and attitudes toward death.

Higher levels of fear of death were found to be significantly correlated with higher levels of death avoidance and approach

acceptance. Fear of death was found to be negatively correlated with neutral acceptance. Higher levels of death avoidance were significantly related to higher levels of approach acceptance and escape acceptance.

Path analysis

Path analysis was conducted in order to examine the possible mediation effect of death avoidance between fear of death and death acceptance attitudes. The overall model fit was satisfactory, $\chi^2(3) = 3.25$, $P = 0.35$, GFI = 0.98, RMSEA = 0.04, CFI = 0.99.

The only direct relationship that was found to be significant was that which existed between neutral acceptance and fear of death ($r = -0.34$, $P < 0.0001$). In other words, the more hemato-oncologists perceived death as a natural part of life, the less they experienced fear of death. The indirect relationship between approach acceptance and fear of death was found to be significant, pointing to a full mediation relationship by death avoidance. That is, hemato-oncologists who perceived death as a passage to a better life (i.e., afterlife) were more death avoidant and experienced more fear of death. Furthermore, the mechanisms responsible for changes in the levels of fear of death differed: Whereas a decrease in fear of death was the result of holding a neutral acceptance attitude, an approach acceptance attitude seemed to cause an elevation in fear of death.

Discussion

The current study broadens our knowledge about attitudes toward death among hemato-oncologists. In contrast with the common perception of death acceptance as an adaptive coping mechanism in the face of the fear of death, the main findings revealed a more complex view of death acceptance that allows a better understanding of the role it plays in relation to fear of death. Approach acceptance of death was related only indirectly to fear of death through the mediation of death avoidance. Nonetheless, fear of death was directly and negatively associated with neutral acceptance of death.

The traditional theory of death and dying has for many years regarded death acceptance as a monolithic concept, considered to be the desired last stage of coping with death (Kübler-Ross, 1969). The evolution of research on attitudes toward death, however, has led to a more complicated perspective on the concept, resulting in a multidimensional construct conceptualization (Gesser et al., 1987; Klug and Sinha, 1987; Wong et al., 1994). This approach has proven to be valuable in the current study, as hemato-oncologists reported different levels of death acceptance in neutral, escape, and approach acceptance, and different patterns of associations emerged.

Table 1. Means, standard deviations, and correlations for attitudes toward death

Measure	M	SD	1	2	3	4	5
1. Fear of death	4.16	1.28	–				
2. Death avoidance	4.84	1.60	0.65**	–			
3. Escape acceptance	4.89	1.36	0.21	0.29*	–		
4. Approach acceptance	5.42	1.28	0.43**	0.43**	0.23	–	
5. Neutral acceptance	2.53	0.96	–0.41**	–0.14	0.06	–0.07	–

*Correlation is significant at the 0.05 level (two-tailed).

**Correlation is significant at the 0.01 level (two-tailed).

Surprisingly, hemato-oncologists reported substantially lower levels of neutral acceptance, as compared with approach and escape acceptance. Similar findings have been found in previous research, where neutral acceptance levels were found to be lower than levels of escape and approach acceptance among physicians who treated geriatric patients (Black, 2007). In other words, hemato-oncologists who as part of their daily work care for dying patients do not seem to perceive death as a natural part of existence. This difficulty in perceiving death as a natural part of life might explain the reported tendency in the literature of hemato-oncologists to perform aggressive treatments at the end of patients' lives and to make fewer referrals to palliative care (Hui *et al.*, 2014; LeBlanc *et al.*, 2015).

The study revealed different roles that death acceptance attitudes might fulfill. Viewing death as a natural part of life was directly associated with a decrease in fear of death, and therefore might be considered to be an adaptive coping mechanism against the fear of death. This finding is consistent with previous research which found that neutral acceptance predicted a lower fear of death (Tomer and Eliason, 2000). These findings are in line with two significant theories that see fear of death as a central existential concern and strive to explain how individuals cope with this fear. According to Terror Management Theory (TMT; Solomon *et al.*, 1991) and Meaning Management Theory (MMT; Wong, 2008), humans differ from other species by our awareness of our mortality. Both theories claim that mortality salience leads individuals to increase pro-cultural and pro-self-esteem activities, in order to cope with the fear of death. However, whereas according to TMT individuals use these actions as an unconscious defense mechanism in order to minimize fear of death, MMT focuses on death acceptance not as a defense against fear of death, but as a positive possible consequence of fear of death, which might direct the individual toward self-actualization and authenticity in life (Wong, 2008).

The association between approach acceptance and fear of death was positive and fully mediated by death avoidance. This finding suggests that approach acceptance is an alternative way to avoid death and its finitude. Whereas accepting death as a natural part of existence represents an adaptive way of coping with the fear of death, viewing death as a passage to a happy afterlife does not result in a decrease of fear; as such, it represents an unsuccessful way to cope with the fear of death. The mediating role of death avoidance suggests that approach acceptance is an alternative way to avoid thoughts about death, a way that has proven to be an unsuccessful coping mechanism against the fear of death, resembling other anxiety disorders in which avoidance behaviors do not reduce fear, but actually increase it (Salters-Pedneault *et al.*, 2004).

Escape acceptance, viewing death as a better alternative to a painful life, had no significant association with fear of death. Nevertheless, hemato-oncologists reported moderate-to-high levels of escape acceptance, a finding that suggests a substantial identification with this attitude. These findings correspond with Wong (2008) and his explanations of the escape acceptance attitude. Hemato-oncologists often encounter human pain and suffering; therefore, it is reasonable for them to think that when life is so painful, death is a better alternative. This approach to death is unique in the way that it does not relate to fear of death. According to Wong (2008), death acceptance is not a defense mechanism against fear of death, and when exposed to morality salience, people who see death as a better alternative to a painful life will not experience an increase in fear of death. For them, life is more frightening than death.

Another interesting finding that requires further research is the lack of associations between the hemato-oncologists' exposure to their patients' suffering and/or death and their attitudes toward death. A possible explanation for this lack of associations may stem from the unique characteristics of the participants, resulting in a ceiling effect which may have clouded the associations between the two. In other words, most hemato-oncologists are exposed to a great deal of patient death and suffering; as such, the lack of variance between these physicians cannot result in differences between them in attitudes toward death.

The current study had several limitations. Even though the sample represented a third of the population of hemato-oncologists in Israel, the response rate was low, resulting in a small sample. Additionally, the cross-sectional nature of the study precludes the possibility of assuming causal relationships. Furthermore, hemato-oncologists with a high fear of death or death avoidance may have avoided participating in the study, a factor that might have biased the results.

Conclusion

The current study presented a unique perspective on attitudes toward death, specifically on death acceptance and its associations with fear of death. The study findings indicate that whereas neutral acceptance adaptively defends one from the fear of death, approach acceptance unexpectedly does just the opposite, through death avoidance. Accordingly, it is reasonable to suggest that some types of death acceptance attitudes are an adaptive coping mechanism against fear of death, whereas others are not. Given that attitudes toward death have proven in previous research to be linked to physicians' professional behaviors, including discussing the patients' advanced directives, collaborating with other healthcare professionals, and experiencing guilt over patients' deaths (Black, 2007; Draper *et al.*, 2019), these findings serve as an important foundation for future research in the field among this unique physician population.

Implications

The importance of the issue at the heart of this study lies in the possible influence of attitudes toward death on the care given to dying patients (Braun *et al.*, 2010). Previous research found that even after controlling for various related variables, hemato-oncologists remained significantly more likely to offer aggressive treatments to patients at the end of their lives, and feel less comfortable discussing death and dying with them and/or referring them to hospice. The researchers concluded that these attitudes play a critical role in the process of decision making in end-of-life care, and suggested that changes in medical interventions in this field are needed (Hui *et al.*, 2015). Our study offers an examination of attitudes toward death which may act as possible motives and an underlying rationale for end-of-life care. The current results may provide fertile ground for a further investigation of the connections between attitudes toward death and end-of-life care, specifically among hemato-oncologists. Interventions should be developed focusing on hemato-oncologists' attitudes toward and coping with death, emphasizing the protective role of death acceptance against fear of death, along with its potential role as a powerful source for growth through meaning management (Wong, 2008).

Conflicts of interest

The authors state that they have no conflicts of interest to declare.

References

- Aase M, Nordrehaug JE and Malterud K (2008) "If you cannot tolerate that risk, you should never become a physician": A qualitative study about existential experiences among physicians. *Journal of Medical Ethics* 34(11), 767–771.
- Abeyta AA, Juhl J and Routledge C (2014) Exploring the effects of self-esteem and mortality salience on proximal and distally measured death anxiety: A further test of the dual process model of terror management. *Motivation and Emotion* 38(4), 523–528.
- Arbuckle JL (2017) *Amos (version 25.0)[computer program]*. Chicago: SpSS.
- Baile WF, Lenzi R, Parker PA, et al. (2002) Oncologists' attitudes toward and practices in giving bad news: An exploratory study. *Journal of Clinical Oncology* 20(8), 2189–2196.
- Black K (2007) Health care professionals' death attitudes, experiences, and advance directive communication behavior. *Death Studies* 31(6), 563–572.
- Braun M, Gordon D and Uziely B (2010) Associations between oncology nurses' attitudes toward death and caring for dying patients. *Oncology Nursing Forum* 37(1), 43–49.
- Dixon RD and Kinlaw BJ (1983) Belief in the existence and nature of life after death: A research note. *OMEGA – Journal of Death and Dying* 13(3), 287–292.
- Draper EJ, Hillen MA, Moors M, et al. (2019) Relationship between physicians' death anxiety and medical communication and decision-making: A systematic review. *Patient Education and Counseling* 102(2), 266–274.
- Eid A, Petty M, Hutchins L, et al. (2009) "Breaking bad news": Standardized patient intervention improves communication skills for hematology-oncology fellows and advanced practice nurses. *Journal of Cancer Education* 24(2), 154–159.
- French C, Greenauer N and Mello C (2017) A multifactorial approach to predicting death anxiety: Assessing the role of religiosity, susceptibility to mortality cues, and individual differences. *Journal of Social Work in End-of-Life & Palliative Care* 13(2–3), 151–172.
- Furer P and Walker JR (2008) Death anxiety: A cognitive-behavioral approach. *Journal of Cognitive Psychotherapy* 22(2), 167.
- Gesser G, Wong PT and Reker GT (1987) Death attitudes across the life-span: The development and validation of the Death Attitude Profile (DAP). *Omega – Journal of Death and Dying* 18(2), 113–128.
- Howell DA, Wang HI, Roman E, et al. (2015) Variations in specialist palliative care referrals: Findings from a population-based patient cohort of acute myeloid leukemia, diffuse large B-cell lymphoma and myeloma. *BMJ Supportive & Palliative Care* 5(5), 496–502.
- Hui D, dos Santos R, Chisholm G, et al. (2014) Clinical signs of impending death in cancer patients. *The Oncologist* 19(6), 681–687.
- Hui D, Bansal S, Park M, et al. (2015) Differences in attitudes and beliefs toward end-of-life care between hematologic and solid tumor oncology specialists. *Annals of Oncology* 26(7), 1440–1446.
- Klug L and Sinha A (1987) Death acceptance: A two-component formulation and scale. *OMEGA – Journal of Death and Dying* 18(3), 229–235.
- Kübler-Ross E (1969) *On death and dying*. New York: Macmillan.
- LeBlanc TW, O'Donnell JD, Crowley-Matoka M, et al. (2015) Perceptions of palliative care among hematologic malignancy specialists: A mixed-methods study. *Journal of Oncology Practice* 11(2), e230–e238.
- Neimeyer RA, Wittkowski J and Moser RP (2004) Psychological research on death attitudes: An overview and evaluation. *Death Studies* 28(4), 309–340.
- Rodenbach RA, Rodenbach KE, Tejani MA, et al. (2016) Relationships between personal attitudes about death and communication with terminally ill patients: How oncology clinicians grapple with mortality. *Patient Education and Counseling* 99(3), 356–363.
- Salters-Pedneault K, Tull MT and Roemer L (2004) The role of avoidance of emotional material in the anxiety disorders. *Applied and Preventive Psychology* 11(2), 95–114.
- Solomon S, Greenberg J and Pyszczynski T (1991) Terror management theory of self-esteem. *Handbook of Social and Clinical Psychology: The Health Perspective* 162, 21–40.
- Tomer A and Eliason G (2000) Attitudes about life and death: Toward a comprehensive model of death anxiety. In Tomer A (ed.), *Death attitudes and the older adult. Theories, concepts, and applications*. Philadelphia: Brunner-Routledge, pp. 3–22.
- Tomer A, Eliason G and Wong P (2007) *Existential and spiritual issues in death attitudes*. New Jersey: Lawrence Erlbaum Associates.
- Whitehead PR (2014) The lived experience of physicians dealing with patient death. *BMJ Supportive & Palliative Care* 4(3), 271–276.
- Wong PTP (2008) Meaning management theory and death acceptance. In Tome A, Eliason GT & Wong PTP (eds.), *Existential and spiritual issues in death attitudes* New York, NY: Erlbaum, pp. 65–87.
- Wong P and Tomer A (2011) Beyond terror and denial: The positive psychology of death acceptance. *Death Studies* 35(2), 99–106.
- Wong PTP, Reker GT and Gesser G (1994) Death Attitude Profile–Revised: A multidimensional measure of attitudes toward death. In Niemeyer RA (ed.), *Death anxiety handbook: Research, instrumentation, and application*. Washington, DC: Taylor & Francis, pp. 121–148.