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Patients' intuitive judgments about surveillance endoscopy in Barrett's esophagus: a review and application to models of decision-making

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SUMMARY

Adherence to practice guidelines for endoscopic surveillance of Barrett's esophagus is equivocal with evidence of underutilization and overutilization. While physicians report strong agreement with and adherence to recommended surveillance endoscopy (esophagogastroduodenoscopy [EGD]) guidelines, less is known about modifiable barriers and facilitators shaping patients' adherence behaviors. The aim of this study is to conduct a structured literature review of studies exploring patients' perspectives regarding surveillance EGD and to place these results within a conceptual framework. A structured literature review of PubMed, Cochrane, and Google Scholar databases with qualitative thematic analysis was performed. Six studies met eligibility criteria. Analysis of results identified five distinct themes. First, patients' objective cancer risk estimates are consistent with subjective risk perceptions, but neither is associated with EGD surveillance. Second, patients have strong beliefs in the benefits of cancer screening and surveillance and trust in their doctors. Third, anxiety and depression symptoms are related to risk perceptions and outcome expectancies of surveillance. Fourth, endoscopic surveillance itself has affective and physical consequences. Finally, health services and system variables are related to risk perception and EGD surveillance. These themes coherently fit within an integrated model of intuitive decision-making and health behaviors. Studies meeting eligibility criteria were heterogeneous in terms of their study objectives and findings. Quantitative meta-analyses of study findings could not be performed. To improve adherence, endoscopic surveillance programs should consider how patients intuitively frame risks and benefits and patients' emotional reactions to the endoscopy procedure, and focus on how physicians communicate recommendations.

Keywords

Barrett's esophagus; cancer surveillance; decision-making; endoscopy; patient preference; risk communication

INTRODUCTION

Approximately 3 million people are diagnosed with Barrett's esophagus (BE) annually in the U.S. The most effective way to detect and monitor the progression of BE to dysplasia and esophageal adenocarcinoma (EAC) is through surveillance endoscopy (esophagogastroduodenoscopy [EGD]). Current guidelines from the American Society for Gastrointestinal Endoscopy and American College of Gastroenterology state that EGDs should occur every 3 years in patients with BE without dysplasia (i.e. surveillance EGD).^{1,2} Prior studies examining utilization patterns of surveillance EGD in patients with BE demonstrate equivocal adherence to guidelines for BE surveillance. A recent national study across Veterans Affairs (VA) facilities found underutilization across all regions, with only 23% of eligible patients with BE receiving guideline-concordant surveillance EGD.³ In contrast, a study of three geographically dispersed, tertiary-care referral centers, including one VA facility, found 95% of patients with BE had regular surveillance EGD⁴ and 65% experienced 'overutilization' compared with guideline-based recommendations.

While previous research has generally found physicians report strong agreement with and adherence to guidelines for surveillance EGD,⁵⁻⁷ greater understanding of patients' preferences, goals, and behaviors related to surveillance EGD is critical for improving adherence to guidelines. Endoscopy can be intrusive and uncomfortable, which can negatively impact patients' health-related quality of life^{8,9} and may affect patients' perceptions of the benefits of surveillance EGD (i.e. outcome expectancy) and subsequent surveillance-related behaviors. It is, therefore, important to understand potentially modifiable barriers and facilitators shaping patients' adherence to surveillance EGD.

To better explicate the patient-centered dimensions of adherence to guidelines for BE surveillance, we conducted a structured literature review of studies exploring patients' perspectives pertaining to surveillance EGD. We identified themes related to perceptions, intentions, and behaviors regarding surveillance EGD derived from results reported by eligible studies. We then placed these themes within the context of contemporary models from the psychology of decision-making and judgment to better understand patients' adherence to clinicians' recommendations.¹⁰⁻¹² The results of this review will guide development of a framework for interventions that promote patient-physician agreement with and adherence to guidelines for surveillance EGD.

METHODS

We conducted a structured review of PubMed to identify studies examining patients' risk perceptions, attitudes, and decisions regarding BE, esophageal cancer, and surveillance EGD. Studies were identified using the medical subject heading (MeSH) search terms: (risk or intention or decision*) and (perceive or perception or perspective) and (esophageal or esophagus or Barrett's).

Eligibility criteria

Studies eligible for inclusion met the following criteria: (i) provided patient's perceptions of esophageal cancer risk; (ii) discussed BE; (iii) included human subjects; (iv) were written in English; and (v) were published in peer-reviewed journals. We excluded studies focusing on health-related quality of life without examining cancer-related perceptions, focusing on any form of risk that was not from the patient's perspective, discussing cost-effectiveness exclusively, or commentaries.

Search strategy

Two reviewers independently conducted the PubMed searches with 100% retrieval agreement. Each conducted manual reviews of titles to exclude articles not focusing on patients' perceptions of BE risks and decisions to undergo surveillance EGD. The reviewers examined abstracts of remaining articles and also conducted an ancestry search of the bibliographies. Finally, a citation tracking search in Google Scholar was conducted.

Data extraction and synthesis

We created a data extraction form to document relevant study characteristics and provide a standardized method for comparing studies. Data collected included: study design, population and setting, methodologies, specific aims/hypothesis, and outcomes. Because of the heterogeneous nature of the reviewed articles, we used qualitative methods to extract and synthesize study findings. We applied principles of qualitative content analysis¹³ and grounded theory analysis¹⁴ to guide our data extraction. Three investigators (MH, JA, AN) independently reviewed all study findings including quantitative results and presentation of descriptive and statistical data in tables. Findings were then independently coded for similarities and clinical significance by each reviewer. Regular meetings of the three independent reviewers focused on the identification of content themes found in two or more reviewed studies. The three reviewers then devised and applied explicit coding criteria to place texts into appropriate themes. Discrepancies in coding were minimal (>90% agreement) and were resolved by consensus.

RESULTS

The first search in PubMed identified 112 articles. After the initial review, by the two independent reviewers, five articles met eligibility criteria. An ancestry and Google Scholar search of the five bibliographies rendered one additional study.

The six studies included cohort designs with repeated measures or cross-sectional studies with single data collection point (Table 1). Five of the six studies focused on BE patients exclusively; while one study⁹ enrolled comparison groups with esophageal cancer and nonspecific upper gastrointestinal symptoms. The vast majority of patients with BE had no dysplasia (Table 1). All studies were conducted with North American or European patient samples and used convenience samples drawn from centers conducting surveillance EGD. The studies focused on cognitive and affective perceptions of cancer risk, their expectations about the benefits and risks of BE surveillance (i.e. outcome expectancies), and behaviors related to surveillance EGD.

We identified five summary themes encompassing the findings of the six studies described in Table 2.

Theme 1: Patients' objective risk estimates for EAC are consistent with their subjective risk perceptions, but neither is associated with EGD surveillance behaviors

Studies reported on patients' objective assessments (how they view other patients' risk) and subjective assessments (their personal risk) for developing EAC. The findings suggest that most patients with BE inaccurately estimate risks (general or personal) of BE progression to EAC (Table 2, theme 1 findings). Two studies^{15,16} focusing on BE patients' objective risk estimates of EAC found that patients underestimate this risk; and two additional studies^{9,16} similarly found that patients' subjective estimates of their own risk were also generally low. One study by Shaheen *et al.*¹⁷ found BE patients overestimated their (subjective) 1-year and lifetime risk of developing EAC. Furthermore, two studies^{4,17} found no significant correlation in surveillance EGD and objective risk estimates.

Theme 2: Patients report having strong beliefs in the benefits of surveillance, but this may be inversely related to trust in one's doctor

One study describes patients' perceptions that surveillance EGD has health benefits that mitigate cancer risk (i.e. outcome expectancy).¹⁵ Other studies in this review discuss the presumption that surveillance has health benefits, but do not offer quantitative data of patients' outcome expectancies to support the claims.¹⁶ One study in this review did attempt to link measures of trust and patients' perceptions of the benefits of surveillance (Table 2, theme 2 findings). Cooper *et al.*¹⁵ used the Trust in Physician Scale (TIPS) and reported increasing TIPS was significantly related to the perception of having received sufficient information about BE and having an understanding of the information. Greater trust as measured by TIPS was correlated with lower anxiety and depression scores and higher quality of life in six of eight domains. Trust was inversely related with the belief that EGD surveillance reduced cancer risk.¹⁵ In essence, these results suggest that lower levels of trust may be related to a belief in the benefit of EGD surveillance.

Theme 3: Anxiety and depression symptoms are related to risk perceptions and outcome expectancies of surveillance

Studies suggest a relationship between affect and risk perception, such that worse affect may be associated with higher risk perception (Table 2, theme 3 findings).^{9,15} Cooper *et al.*¹⁵ showed higher affective symptom scores correlated with increased estimates by BE patients of their chances of developing cancer, and concerns about developing cancer over the next 10 years. Kruijshaar *et al.*⁹ found that higher perceived risk predicted higher anxiety, depression, and distress. This association did not differ before and after EGD.

Theme 4: Endoscopic surveillance itself has affective and physical consequences

Findings from the reviewed studies suggest that EGD procedure itself may significantly impact patients' lives in several ways. Two studies^{8,16} found that patients with BE frequently report discomfort (but not pain) and significant burdens with endoscopy procedures; and these complaints were greater among patients with higher perceptions of subjective cancer risk (Table 2, theme 4 findings). Anticipation of the endoscopy procedure is also associated with higher adverse affective (anxiety, depression, and distress) and functional symptoms.^{8,9,16} Findings suggest negative affect may increase as the EGD date approaches, peaking on the day of the EGD.⁸

Theme 5: Health services and systems variables are related to risk perception and EGD surveillance

The findings related to theme 5 in Table 2 centered on the role of health system and insurance factors. Shaheen *et al.*'s¹⁷ multisite study assessed the relationship between risk perceptions and variables related to health services and systems. They found lifetime risk perceptions varied depending on the type and access to a clinical facility and presence of symptoms. Crockett *et al.*⁴ examined the relationship between several exogenous variables and EGD surveillance. They found that patients with private insurance were more likely to overutilize EGD than patients with Medicare or VA patients. Other patient-related variables were not significantly associated with adherence to EGD surveillance in BE patients.⁴

DISCUSSION

The current review describes key findings across six studies characterizing the perceptions, intentions, and behaviors of BE patients participating in surveillance endoscopy. Table 2 details and summarizes the key findings according to five themes. To better synthesize results from the reviewed studies, we placed the themes of the current review within an

integrated model (Fig. 1) that incorporates the Fuzzy Trace Theory (FTT) of intuitive decision-making¹⁰ with the Reasoned Action Approach for modeling patients' health behaviors.¹² Using this integrated model, we describe important knowledge gaps and potential targets for future interventions to improve adherence to surveillance EGD.¹⁸

FTT began with observations that precise quantitative information of risk (e.g. 0.5–0.9% annual rate of progression to cancer in BE patients) provides an analytical evaluation of risk (Fig. 1, box A) but often does not improve one's practical understanding of risk.¹⁹ Judgments about risk rely on capturing the 'bottom-line meaning of information' (i.e. gist evaluation: Fig. 1, box B).¹⁰ Consistent with the process of intuitive decision-making (middle of Fig. 1), our first theme finds that patients' gist perceptions of cancer risk are appropriate (i.e. the risk of progression to cancer is low) despite their poor accuracy with quantitative risk information as evidenced by the conflicting findings of Kruijshaar *et al.*^{9,16} and Shaheen *et al.*¹⁷ Our first theme further suggests that gist evaluations of risk may not directly translate to surveillance EGD behaviors. Our integrative model describes a number of variables that moderate the link between gist evaluations of risk and adherence to risk prevention behaviors (right side of Fig. 1). Many of these variables are elaborated by the remaining themes of this review.

In FTT, decisions to act arise only after people filter their gist evaluations against relevant values, norms, emotions, and prior knowledge (Fig. 1, box C).¹⁰ Our second theme describes two relevant norms: 'cancer screening and surveillance are always beneficial' and 'when uncertain, trust in your doctor'. Striking was the comment in several studies that patients believe in the value of surveillance EGD even with little objective evidence to support its efficacy and low overall perceptions of cancer risk. Such norms can bias overall judgments about the value of particular health behaviors.^{20,21} Redelmeier *et al.*²¹ describe how any risk above zero is salient in patients' minds, especially if the risk is categorized as 'dangerous' by our social influences especially doctors and family members. Even a small risk of progression to cancer (e.g. 5% over 10 years) among patients with BE, especially when supported as 'dangerous' by one's physician, can strongly influence health behaviors.^{22,23} Interestingly, Cooper *et al.*¹⁵ elegantly describe how these two norms can conflict. In that study, trust in one's physician moderated the belief that 'cancer surveillance is always beneficial' with higher levels of trust being associated with less endorsement of the norm that cancer surveillance is always beneficial. These findings suggest that the normative messages patients receive from physicians are often more powerful than objective, quantitative risk data.

Risk information can also evoke emotions and emotional memories (Fig. 1, boxes B and C) that shape subsequent gist evaluations of risk and decisions to act.²⁴ Patients' emotional states during the time they receive objective risk information have a surprising salient effect on their gist evaluations of personal risk (i.e. well described in the decision-making literature as *affect heuristic*).²⁵ The third theme of the review demonstrates the role of affect heuristic on judgments of surveillance EGD. Endorsement of anxiety and depressive symptoms at the time of surveillance EGD was associated with greater perceptions of risk among BE patients. Trust in one's physician was again observed as an important moderator of affect heuristic.¹⁵ These findings suggest that attention to emotions that surround patient–clinician discussions about surveillance EGD are an underexplored determinant of adherence behaviors.

Our fourth theme describes how the endoscopy procedure itself can produce emotional and physical symptoms. Discomfort during the EGD procedure can produce salient memories that negatively shape gist evaluations of subsequent surveillance EGD (Fig. 1, boxes C and B). Related evidence by Redelmeier and Kahneman found that patients' memories of a

recent colonoscopy procedure were dominated by the most salient aspects (i.e. the peak discomfort levels and the final stages) of the colonoscopy experience.²⁶ Further, these salient memories were significantly associated with adherence to follow-up colonoscopy in multivariate analysis.²⁷

Intuitive decision-making models describe how humans mentally frame representations of risk information (Fig. 1, boxes D and A) within existing values and world views (Fig. 1, box C) to arrive at a bottomline understanding of their risk (Fig. 1, box B). The dynamic process of intuitive decision-making ultimately results in a behavioral intention – in our example, the intention to adhere (or not adhere) to surveillance EGD recommendations (Fig. 1, box E). Behavioral intentions are empirically the strongest predictors of patients' actual adherence to health behaviors, as modeled by the Reasoned Action Approach.¹² Aside from intentions, adherence to surveillance EGD is moderated by trust in physicians' recommendation for surveillance EGD (Fig. 1, box F) and an absence of constraints or presence of facilitators within patients' environments (Fig. 1, box G). Our fifth theme highlights the importance of variables that moderate the relationship between patients' behavioral intention and their adherence to surveillance EGD (Fig. 1, boxes E to H). These variables can strengthen or weaken the behavioral intention– performance relationship. For example, Crockett *et al.*⁴ describes 'overutilization' of surveillance EGD driven by insurance, health system, and physician variables, while other studies describe 'underutilization' of surveillance EGD in non-tertiary-care centers without financial or insurance incentives.²⁸

Clinical implications

This review produced five themes that drive patients' judgments, intentions, and behaviors related to their participation in surveillance EGD programs, and placed those themes into the context of relevant psychological theories. From this review, we have developed an integrated theory that can guide the development of future interventions to improve EGD surveillance. In designing such interventions, we recommend the following considerations.

- Interventions should focus on improving patients' bottom-line understanding (gist) of their cancer risk rather than teaching precise quantitative risk estimates that have little personal meaning. Suggestions include providing clear comparisons with other more common health conditions, asking family members to participate in risk discussions, and asking patients to recite their gist evaluations before concluding.
- Additional evidence is needed regarding the effectiveness of surveillance EGD in routine clinical care, including the optimal surveillance intervals. Patients and even physicians seem to act on the unsubstantiated norm that 'cancer surveillance is always beneficial.' Better evidence would recalibrate norms, improve patients' trust in physician recommendations, and likely reduce the degree of overutilization and underutilization of EGD surveillance.
- Physicians should ask about patients' emotions and feelings in addition to bottom-line understanding of risk when discussing cancer risk and prevention behaviors. Developing standardized scripts and techniques for cancer risk discussions that focus on reducing anxiety and uncertainty may improve bottom-line understanding and adherence to surveillance behaviors.
- Finally, patients' memories of EGD influence their decisions to participate in surveillance, and therefore endoscopists should avoid minimizing patients' complaints of discomfort around and during the EGD procedure. Simple efforts to elicit, acknowledge, and assuage complaints or discomfort may reduce negative memories of EGD.

These basic principles can be bundled together into an intervention to improve adherence to surveillance behaviors.

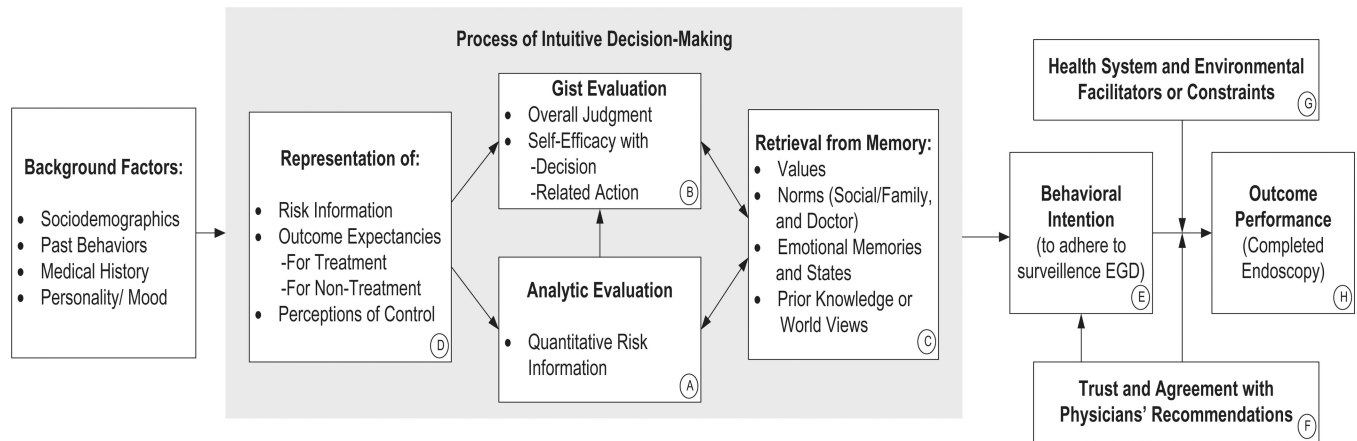
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References

1. Hirota WK, Zuckerman MJ, Adler DG, et al. ASGE guideline: the role of endoscopy in the surveillance of premalignant conditions of the upper GI tract. *Gastrointest Endosc.* 2006; 63:570–580. [PubMed: 16564854]
2. Wang KK, Sampliner RE. Practice Parameters Committee of the American College of Gastroenterology. Updated guidelines 2008 for the diagnosis, surveillance and therapy of Barrett's esophagus. *Am J Gastroenterol.* 2008; 103:788–797. [PubMed: 18341497]
3. El-Serag HB, Duan Z, Hinojosa-Lindsey M, et al. Practice patterns of surveillance endoscopy in VA database of 29,504 patients with Barrett's esophagus. *Gastrointest Endosc.* 2012; 76(4):743–755. [PubMed: 22985642]
4. Crockett SD, Lipkus IM, Bright SD, et al. Overutilization of endoscopic surveillance in nondysplastic Barrett's esophagus: a multicenter study. *Gastrointest Endosc.* 2012; 75:23–31. [PubMed: 22100301]
5. Falk GW, Ours TM, Richter JE. Practice patterns for surveillance of Barrett's esophagus in the United States. *Gastrointest Endosc.* 2000; 52:197–203. [PubMed: 10922091]
6. Gross CP, Canto MI, Hixson J, et al. Management of Barrett's esophagus: a national study of practice patterns and their cost implications. *Am J Gastroenterol.* 1999; 94:3440–3447. [PubMed: 10606300]
7. Van Sandick JW, Bartelsman JF, Van Lanschot JJ, et al. Surveillance of Barrett's oesophagus: physicians' practices and review of current guidelines. *Eur J Gastroenterol Hepatol.* 2000; 12:111–117. [PubMed: 10656220]
8. Essink-Bot ML, Kruijschaar ME, Bac DJ, et al. Different perceptions of the burden of upper GI endoscopy: an empirical study in three patient groups. *Qual Life Res.* 2007; 16:1309–1318. [PubMed: 17634755]
9. Kruijschaar ME, Kerkhof M, Siersema PD, et al. The burden of upper gastrointestinal endoscopy in patients with Barrett's esophagus. *Endoscopy.* 2006; 38:873–878. [PubMed: 17019759]
10. Reyna VF, Rivers SE. Current theories of risk and rational decision making. *Dev Rev.* 2008; 28:1–11. [PubMed: 19255598]
11. Gigerenzer G, Gaissmaier W. Heuristic decision making. *Annu Rev Psychol.* 2011; 62:451–482. [PubMed: 21126183]
12. Fishbein M. A reasoned action approach to health promotion. *Med Decis Making.* 2008; 28:834–844. [PubMed: 19015289]
13. Ball, MS.; Smith, GWH. *Analyzing Visual Data.* Newbury Park, CA: Sage Publications; 1992.
14. Strauss, AL.; Corbin J, M. *Grounded Theory in Practice.* 2nd edn.. Thousand Oaks, CA: SAGE; 1998.
15. Cooper SC, El-agib A, Dar S, et al. Endoscopic surveillance for Barrett's oesophagus: the patients' perspective. *Eur J Gastroenterol Hepatol.* 2009; 21:850–854. [PubMed: 19598328]
16. Kruijschaar ME, Siersema PD, Janssens AC, et al. Patients with Barrett's esophagus perceive their risk of developing esophageal adenocarcinoma as low. *Gastrointest Endosc.* 2007; 65:26–30. [PubMed: 17185076]
17. Shaheen NJ, Green B, Medapalli RK, et al. The perception of cancer risk in patients with prevalent Barrett's esophagus enrolled in an endoscopic surveillance program. *Gastroenterology.* 2005; 129:429–436. [PubMed: 16083700]

18. Conner, M.; Norman, P. Predicting Health Behavior: A Social Cognition Approach. Buckingham: Open University Press; 2005.
19. Reyna VF, Brainerd CJ. Fuzzy-trace theory: an interim synthesis. *Learn Individ Dif.* 1995; 7:1–75.
20. Gilovich, T.; Griffin, D.; Kahneman, D. *Heuristics and Biases: The Psychology of Intuitive Judgment.* New York: Cambridge University Press; 2012.
21. Redelmeier DA, Rozin P, Kahneman D. Understanding patients' decisions. Cognitive and emotional perspectives. *JAMA.* 1993; 270:72–76. [PubMed: 8510300]
22. Zikmund-Fisher BJ, Fagerlin A, Ubel PA. Risky feelings: why a 6% risk of cancer does not always feel like 6%. *Patient Educ Couns.* 2010; 81(Suppl):S87–S93. [PubMed: 20739135]
23. El-Serag HB, Naik AD. Surveillance in Barrett's esophagus: lessons from behavioral economics. *Gastroenterology.* 2009; 137:763–765. [PubMed: 19643189]
24. Damsio, AR. *Descartes' Error: Emotion, Reason, and the Human Brain.* New York: HarperCollins; 1994.
25. Slovic P, Finucane ML, Peters E, et al. Risk as analysis and risk as feelings: some thoughts about affect, reason, risk, and rationality. *Risk Anal.* 2004; 24:311–322. [PubMed: 15078302]
26. Redelmeier DA, Kahneman D. Patients' memories of painful medical treatments: real-time and retrospective evaluations of two minimally invasive procedures. *Pain.* 1996; 66:3–8. [PubMed: 8857625]
27. Redelmeier DA, Katz J, Kahneman D. Memories of colonoscopy: a randomized trial. *Pain.* 2003; 104:187–194. [PubMed: 12855328]
28. Ajumobi A, Bahjri K, Jackson C, et al. Surveillance in Barrett's esophagus: an audit of practice. *Dig Dis Sci.* 2010; 55:1615–1621. [PubMed: 19669878]

**Fig. 1.**

Integrative framework of intuitive decision-making and reasoned action for predicting patients' adherence to surveillance endoscopy (esophagogastroduodenoscopy [EGD]). The shaded area is an illustration of the process of intuitive decision-making adapted from psychological models of decision-making and judgment. Intuitive decision-making begins with any new representation of information about risk, treatments, and outcomes. Representations are given meaning only after they are contextualized within a set of values, norms, emotions, or existing knowledge and world views; which are retrieved rapidly from memory. The contextualization of this new information within an existing framework then results in a gist evaluation. Gist is the bottom-line meaning of any cognitive process. If the representational information is numeric or specific in nature (i.e. verbatim), it is often processed analytically as well, but also with a process of retrieval of prior knowledge from memory. Analytic evaluations can then impact gist evaluations to produce an overall judgment. Overall judgments are informed by fuzzy and verbatim information. Gist evaluations contribute to one's sense of self-efficacy about a decision and the confidence to act effectively on that decision. Elements to the right of the shaded area represent an adaptation of the Reasoned Action Approach for health behaviors. Models of health behaviors are centered on the relation of one's intention to perform a specific behavior and the actual performance of that behavior. Intentions are the single most important predictor of performance. Health behavior intentions are strongly influenced by overall judgments, self-efficacy, and trust with one's own physician. At times, health system and environmental facilitator and constraints along with trust in one's physicians can moderate the intention–behavior relationship.

Table 1

Description of reviewed studies

Author	Study design	Study setting and population	Measures
Cooper <i>et al.</i> 2009 ¹⁵	Cross-sectional survey	Sites: 3 hospitals Participants: 151 patients undergoing endoscopic surveillance of BE <ul style="list-style-type: none"> • 101 male participants • Median age: 66 • BE characteristics <ul style="list-style-type: none"> – Median length of Barrett's segment: 5 cm – No dysplasia: 90% – Indefinite for dysplasia: 3% – Low-grade dysplasia: 7% 	<ul style="list-style-type: none"> • Hospital Anxiety and Depression Scale • Trust in Physician Scale (TIPS) • Short Form-36 Questionnaire
Essink-Bot <i>et al.</i> 2007 ⁸	Cohort study with prospective repeated measures	Sites: 3 hospitals Participants: 476 total patients including 180 with BE; 214 with nonspecific upper GI symptoms (NS), and 82 with GI cancer (CA) <ul style="list-style-type: none"> • 476 male participants • Mean age: BE (62), NS (54), CA (64) • BE characteristics <ul style="list-style-type: none"> – No dysplasia: 78% – Low-grade dysplasia: 22% 	Questionnaire before and after endoscopy: <ul style="list-style-type: none"> • Perceived burden of upper endoscopy • Measures of pain and discomfort • Burden experienced during endoscopy • Psychological distress
Kruijschaar <i>et al.</i> 2006 ⁹	Cohort study with prospective repeated measures	Sites: 3 hospitals Participants: 192 patients with BE without high-grade dysplasia or carcinoma. <ul style="list-style-type: none"> • 127 male participants (66%) • Mean age: 62 years • BE characteristics <ul style="list-style-type: none"> – No dysplasia: 77.8% – Low-grade dysplasia: 22.2% 	Impact of Event Scale (IES) 1 week before and after endoscopy to assess: <ul style="list-style-type: none"> • Discomfort during endoscopy • Symptoms • Psychological burden • Perceived risk of developing cancer
Kruijschaar <i>et al.</i> 2007 ¹⁶	Cohort study with prospective repeated measures	Sites: 3 hospitals Participants: 192 patients with BE without high-grade dysplasia or carcinoma. <ul style="list-style-type: none"> • 127 male participants (66%) • Mean age: 62 years • BE characteristics <ul style="list-style-type: none"> – No dysplasia: 80% – Low-grade dysplasia: 20% 	Questionnaires assessing: <ul style="list-style-type: none"> • Perceived Risk and Estimated Risk before endoscopy and the • EQ-5D measure of health-related quality of life.
Shaheen <i>et al.</i> 2005 ¹⁷	Cross-sectional	Sites: 2 hospitals (academic and VA hospital) Participants: 92 patients in EGD surveillance.	Risk Perception Questionnaire (49 items).

Author	Study design	Study setting and population	Measures
		<ul style="list-style-type: none"> 41 males at academic (63%) and 27 at VA (100%) Mean age: 56.2 at academic and 63.1 at VA BE characteristics <ul style="list-style-type: none"> No current dysplasia: 100% 	<ul style="list-style-type: none"> Asked to estimate risk for developing various common medical conditions.
Crockett <i>et al.</i> 2012 ⁴	Cross-sectional; multicenter	Sites: 3 hospitals: Participants: 235 patients with BE without dysplasia for >6 months. <ul style="list-style-type: none"> 178 males (76%) Mean age: 62 BE characteristics <ul style="list-style-type: none"> No dysplasia: 100% 	Questionnaires assessed: <ul style="list-style-type: none"> GERD-specific quality of life, Short Form-36; 8-item numeracy scale Risk Perception Tool

BE, Barrett's esophagus; EGD, esophagogastroduodenoscopy; EQ-5D, EuroQol-5 dimensions; GERD, gastroesophageal reflux disease; GI, gastrointestinal; VA, Veterans Affairs.

Table 2

Summary of review themes, supporting findings, and relationship to theoretical models of decision-making and health behaviors

Themes	Findings	Correspondence to theory
1) Patients' objective risk estimates are consistent with their subjective risk perceptions, but neither is associated with EGD surveillance behaviors	<p>Risk estimates of progression to cancer are inaccurate.</p> <ul style="list-style-type: none"> 69% of patients <i>underestimated</i> their personal subjective risk of esophageal cancer¹⁶ 63% perceived their risk to be 'small or very small'.¹⁶ More than two thirds of BE participants overestimated their 1-year risk of developing EAC.¹⁷ <p>Objective and subjective risk estimates are similar with each other.</p> <ul style="list-style-type: none"> 58% of patients underestimated their 10-year risk of developing cancer.¹⁵ 60% of patients underestimated their objective risk estimations.¹⁶ 38% of patients overestimated their lifetime risk of developing cancer.¹⁷ <p>Risk estimates do not seem to correlate to EGD surveillance adherence.</p> <ul style="list-style-type: none"> Despite overall low perceived risk, majority of patients were adherent to surveillance.¹⁶ No significant difference in risk perceptions between overestimators and underestimators.¹⁷ 	Gist estimates of risk are more salient than verbatim risk estimates. Even when estimates are low, risks greater than zero are important in framing patients risk estimates.
2) Patients report having strong beliefs in the benefits of surveillance, but this may be inversely related to trust in one's doctor.	<p>EGD surveillance is assumed to mitigate the risk of progression to cancer despite lack of data.</p> <ul style="list-style-type: none"> Patients' outcome expectancies of surveillance EGD: 74% of participants felt surveillance would reduce risk of developing cancer. Of these, 49% thought the risk was greatly reduced and 5% believed risk was completely negated.¹⁵ <p>Trust in one's physician moderates patients' perceptions of the effectiveness of surveillance, affective responses to EGD procedures, and quality of life (QOL) in patients with BE</p> <ul style="list-style-type: none"> Higher scores on 'Trust In Physician Scale' (TIPS) were associated with patients more likely to report being given ($r = 0.33, P < 0.001$) and understanding ($r = 0.2, P = 0.037$) BE-related information, less anxiety ($r = -0.2, P = 0.015$), and depression ($r = -0.28, P = 0.001$).¹⁵ TIPS has positive correlation with 6 of 8 QOL domains: (role limitation because of physical problems $r = 0.26, P = 0.002$; general perception of health $r = 0.19, P = 0.019$; energy and vitality $r = 0.23, P = 0.006$; social functioning $r = 0.19, P = 0.024$; role limitation because of emotional problems $r = 0.19, P = 0.022$; and mental health $r = 0.17, P = 0.043$). Higher TIPS score was inversely correlated with the belief that EGD surveillance decreases EA risk ($r = -0.19, P = 0.025$).¹⁵ 	Intentions to adhere to EGD surveillance are driven by the value of 'cancer screening is beneficial' and the norm of 'when uncertain, trust your doctor'.
3) Anxiety and depression symptoms are related to risk perceptions and	Higher depression and anxiety at baseline are associated with higher perceptions of cancer risk	Emotional responses to risk information impact the positive or negative gist of risk evaluations and behaviors to mitigate risk (i.e. affect heuristic).

Themes	Findings	Correspondence to theory
outcome expectancies of surveillance	<ul style="list-style-type: none"> Higher affective symptom scores in BE patients were associated with increased cancer risk perceptions.¹⁵ <p>Patients with high risk perceptions seem to have more anxiety and depression at all time points</p> <ul style="list-style-type: none"> Anxiety ($P = 0.01$), depression ($P = < 0.0001$), distress ($P = 0.000$) levels increased in week before EGD, compared with week after.⁹ 	
4) Endoscopic surveillance itself has affective and physical consequences	<p>EGD procedures are associated with physical discomfort and negative affective symptoms</p> <ul style="list-style-type: none"> Patients who perceived risk of adenocarcinoma as high, reported greater discomfort ($P = 0.02$), and viewed EGD as more burdensome ($P = 0.01$).¹⁶ 42% of patients with BE reported some discomfort or pain with EGD; 63% reported discomfort with introduction of scope; 56% during EGD; and 59% reported EGD as burdensome.¹⁶ 14% of patients reported pain during EGD with 47% reporting throat ache and 23% reporting dysphagia after EGD.¹⁶ Discomfort was higher among unsedated patients ($P < 0.01$), and differed between hospitals ($P < 0.01$).¹⁶ Patients with higher levels of perceived cancer risk reported greater levels of discomfort and more burden ($P = 0.02$ and 0.01, respectively).¹⁶ <p>Affective symptoms tend to be more anticipatory related to EGD surveillance and improve after the procedure</p> <ul style="list-style-type: none"> Anxiety, depression, distress levels were higher the week prior to EGD.⁹ On the day of the EGD, 23% of patients had scores indicative of clinical anxiety, 17% of borderline anxiety, 2% of clinical depression, 5% of borderline depression, and 6% of high distress.⁹ <p>BE patients' IES-distress scores regarding EGD were higher before the procedure ($M = 5.5$, $SD = 9.5$) than 1 week after ($M = 3.5$, $SD = 7.7$).⁸</p>	Memories of endoscopy are framed by high-intensity emotions and the last memories of the procedure (peak and end experiences). These 'peak and end' experiences impact adherence to cancer screening.
5) Health services and system variables are related to risk perception and EGD surveillance	<p>Health insurance status and site of EGD surveillance care are associated with risk perceptions and adherence to EGD surveillance</p> <ul style="list-style-type: none"> Veteran patients perceived a significantly higher risk of developing EAC than university hospital patients (23.7% vs. 9.5%, $P < 0.01$).¹⁷ Patients with private insurance had greater overutilization compared with Medicare and VA (53% vs. 22%, 23%, respectively, $P = 0.05$).⁴ <p>EGD surveillance in single-payer VA system most closely adhered to published guidelines.⁴</p>	With strong intention, demand tends to be insurance and supply driven.

EA, esophageal adenocarcinoma; EGD, esophagogastroduodenoscopy; M, mean; SD, standard deviation; VA, Veterans Affairs.