
RSNA Press Release

Patients Accept False-Positives to Achieve Diagnostic Sensitivity

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OAK BROOK, Ill. (September 23, 2014) — Both patients and healthcare professionals believe diagnosis of extracolonic malignancy with screening computed tomography (CT) colonography greatly outweighs the potential disadvantages of subsequent radiologic or invasive follow-up tests precipitated by false-positive diagnoses, according to a new study published in the October issue of the journal *Radiology*.

Diagnostic tests used for cancer screening programs usually target a specific organ. However, when screening for colorectal cancer with CT colonography, abdominal and pelvic tissues outside the colon are imaged unavoidably, which can potentially detect disease in organs other than the primary target. These extracolonic findings present a clinical dilemma. Early diagnosis of important findings might offer life-saving benefits, but unnecessary investigation of ultimately irrelevant findings has physical, psychological and financial costs.

At A Glance

- Early diagnosis of important extracolonic findings might offer life-saving benefits, but unnecessary investigation of ultimately irrelevant findings has physical, psychological and financial costs.
- Patients are highly tolerant of additional testing resulting from false-positive extracolonic findings during a CT colonography exam.
- The average participant was prepared to tolerate 60 unnecessary additional invasive tests in exchange for diagnosis of a single extracolonic malignancy.

To determine how patients and healthcare professionals balance these factors, Steve Halligan, M.B.B.S., M.D., FRCP, FRCR, from the Centre for Medical Imaging at University College London in London, U.K., and colleagues conducted a discrete choice experiment, interviewing 52 adults (mean age 64.5 years) who were scheduled at the hospital for unrelated ultrasound exams and 50 health professionals (mean age 24.5 years) who requested, performed or interpreted colorectal imaging exams.

"There has been surprisingly little prior research relating to trade-offs. Asking patients and professionals to rank their preferences is uninformative because they stipulate an accurate, convenient, safe and cheap test," Dr. Halligan said. "In reality, these attributes are traded against one another: would you swap increased accuracy for less convenience? Discrete choice experiments investigate how attributes are traded against one another but are rarely used for imaging tests. Findings from discrete choice experiments may be controversial, but discussion of how to allocate increasingly scarce resources cannot be informed without the results of such experiments."

Participants undertook two separate experiments. In the first experiment, participants were told that false-positive extracolonic diagnosis would require unnecessary further imaging. Participants were instructed to assume the rates of such imaging to be 50 percent ultrasound, 45 percent CT, and 5 percent magnetic resonance imaging (MRI). Disadvantages of imaging were explained as follows: ultrasound and MRI were described as safe, but might cause inconvenience and anxiety. MRI was also described as noisy and associated with claustrophobia. CT was described as including a very small chance of cancer induction several years afterward.

In the second experiment, false-positive diagnoses led to biopsy, endoscopy or surgery. Participants were instructed to assume that approximately 50 percent of invasive tests would be surgical, 25 percent would be needle biopsy, and 25 percent would be endoscopy. Pain, bleeding, perforation, and a small risk of death were mentioned as possible complications.

"What we found was that both patients and healthcare professionals were very willing to trade false-positive diagnoses that resulted in unnecessary radiologic or invasive tests for a gain in diagnostic sensitivity," Dr. Halligan said.

The primary outcome measure was the maximum false-positive rate that the average participant was willing to accept in exchange for a one-in-600 chance of diagnosing an extracolonic malignancy, or the so-called tipping point.

When the consequence of extracolonic findings was radiologic testing, the average participant was prepared to tolerate at least a 99.8 percent rate of unnecessary additional radiologic tests to diagnose a single additional extracolonic malignancy. Overall, at a prevalence of one in 600 for potentially curable extracolonic malignancy, this corresponds to more than 599 unnecessary additional radiologic tests to find one potentially curable extracolonic malignancy.

When the consequence of extracolonic findings was invasive testing, the average participant was prepared to tolerate a 10 percent rate of unnecessary additional invasive tests in exchange for diagnosis of a single extracolonic malignancy. Overall, at population prevalence of one in 600, this corresponds to 60 additional invasive tests per extracolonic malignancy.

In both cases, the patients were willing to tolerate unnecessary additional tests at higher rates than the healthcare professionals.

"Because they are more informed about the costs and consequences, especially of additional invasive testing, healthcare professionals were slightly less prepared to tolerate as many false-positives as the patients were," Dr. Halligan said.

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"Detection of Extracolonic Pathologic Findings with CT Colonography: A Discrete Choice Experiment of Perceived Benefits versus Harms." Collaborating with Dr. Halligan on this study were Andrew A. Plumb, M.A., MRCP, FRCR, Darren Boone, M.B.B.S., MRCS, FRCR, Heather Fitzke, B.Soc.Sci., Emma Helbren, M.B.Ch.B., FRCR, Susan Mallett, D.Phil., Shihua Zhu, M.Sc, Ph.D, Guiqing L. Yao, M.Sc., Ph.D., Nichola Bell, B.Sc., Alex Ghanouni, M.Sc., Christian von Wagner, Ph.D., Stuart A. Taylor, M.B.B.S., M.D., MRCP, FRCR, Douglas G. Altman, D.Sc., and Richard Lilford, Ph.D., FRCOG, FRCP, FFPH.

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