

# Single-Exposure, Dual-Energy Subtraction Flat Panel X-Ray Detectors

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## Recommendation

November 2024

# Final Recommendation

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Ontario Health, based on guidance from the Ontario Health Technology Advisory Committee, concludes there is currently insufficient evidence to make a recommendation for or against publicly funding single-exposure, dual-energy subtraction flat panel x-ray detectors.

## Rationale for the Recommendation

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The Ontario Health Technology Advisory Committee made the above recommendation after considering the clinical, economic, and health care providers perspectives evidence reported in the health technology assessment (HTA).<sup>1</sup>

Single-exposure, dual-energy subtraction (DES) flat panel x-ray detectors produce soft tissue and bone x-ray images in addition to the standard conventional x-ray image. Based on the currently available evidence, it is unclear whether there is additional clinical benefit with the use of single-exposure, dual-energy subtraction flat panel x-ray detectors compared with conventional x-ray for detecting pneumonia or pulmonary nodules, among other conditions, or for visualizing placement of medical lines and tubes in the chest. The committee acknowledged that no evidence was identified for the use of this technology for most populations and outcomes that the HTA sought to evaluate, including the impact on patient management and clinical outcomes.

Ontario Health Technology Advisory Committee members recognized that low-dose computed tomography (CT) scanning is used for lung cancer screening and CT scanning is used in the assessment of pulmonary nodules. The role for single-exposure, DES flat panel x-ray detectors in these scenarios is uncertain. Similarly, the committee acknowledged that the current hospital x-ray systems have sufficient resolution to visualize the positioning in the chest of medical lines and tubes and therefore the role and incremental benefit of single-exposure, DES flat panel x-ray detector technology in these scenarios is uncertain.

Due to insufficient evidence, the cost-effectiveness of single-exposure, DES flat panel detectors is unknown. From an Ontario hospital perspective, the budget impact for purchasing 3 single-exposure, DES flat panel detectors and retrofitting existing x-ray machines was estimated to be an additional \$12,137 per institution. This estimate did not include other implementation costs (e.g., training, maintenance, and technical support, etc.). The committee noted that currently, for most hospitals, diagnostic equipment is funded through donation, and generally there is a 5-year capital plan for purchasing equipment. The committee encourages future decision-making about the adoption of single-exposure, DES technology be considered by hospital capital planning committees.

Committee members considered the perspectives of clinical experts in diagnostic imaging who mentioned issues with retrofitting the single-exposure, DES technology into existing x-ray machines and the usability of the DES detector. There were differing opinions on the clinical value of the single-exposure, DES detector.

# Decision Determinants for Single-Exposure, Dual-Energy Subtraction Flat Panel X-Ray Detectors

## Overall Clinical Benefit

### Effectiveness

*How effective is the health technology/intervention likely to be (taking into account any variability)?*

- The use of the single-exposure, DES soft tissue x-ray image plus the conventional x-ray image obtained using a single-exposure, DES flat panel x-ray detector may lead to an improvement in the sensitivity and specificity to detect pulmonary nodule calcification compared with using a conventional x-ray image alone (Grading of Recommendations Assessment, Development and Evaluation [GRADE]: Low)
- The evidence is very uncertain for the effect of using the single-exposure, DES soft tissue and bone x-ray images plus the conventional x-ray image obtained using a single-exposure, DES flat panel x-ray detector to improve the visibility of the tips of lines and tubes, diagnostic confidence, and time to review the x-ray images compared with using the conventional x-ray image alone (GRADE: Very low)

Evidence gaps:

- No evidence was identified for the use of single-exposure, DES flat panel x-ray detectors for most indications and outcomes that we sought in the health technology assessment:
  - Sensitivity and specificity were not assessed for most of the indications that we sought to evaluate (e.g., detection of pneumonia, pulmonary nodules, etc.)
  - No evidence was identified for its impact on changes in patient management, clinical outcomes, need for other imaging procedures such as CT scanning, etc.

### Safety

*How safe is the health technology/intervention likely to be?*

Not assessed.

## Burden of Illness

*What is the likely size of the burden of illness pertaining to this health technology/intervention?*

Chest x-ray is the most common imaging test for the detection of chest conditions.

## Need

*How large is the need for this health technology/intervention?*

The need for this health technology in Ontario is currently uncertain.

## Patient Preferences and Privacy

### Patient Preferences and Values

*Do patients have specific preferences, values, or needs related to the health condition, health technology/intervention, or life impact that are relevant to this assessment?*

We did not identify any specific patient preferences, values, or needs related to this health technology.

### Autonomy, Privacy, Confidentiality, and/or Other Relevant Ethical Principles as Applicable

*Are there concerns regarding accepted ethical or legal standards related to patient autonomy, privacy, confidentiality, or other ethical principles that are relevant to this assessment?*

We did not identify any concerns related to patient autonomy, privacy, or confidentiality.

## Equity and Patient Care

### Equity of Access or Outcomes

*Are there disadvantaged populations or populations in need whose access to care or health outcomes might be improved or worsened that are relevant to this assessment?*

We did not identify any relevant disadvantaged populations or populations in need.

### Patient Care

*Are there challenges in the coordination of care for patients or other system-level aspects of patient care (e.g., timeliness of care, care setting) that might be improved or worsened that are relevant to this assessment?*

We did not identify any challenges in the coordination of care for patients.

## Cost-Effectiveness

### Economic Evaluation

*How efficient is the health technology/intervention likely to be?*

The cost-effectiveness of single-exposure, DES flat panel detectors is currently unknown due to insufficient evidence.

## Feasibility of Adoption Into Health System

### Economic Feasibility

*How economically feasible is the health technology/intervention?*

Purchasing 3 single-exposure, DES flat panel detectors to retrofit existing x-ray machines would require an additional \$12,137 per institution. The exact budget impact may depend on purchase decision (e.g., detectors or x-ray devices), and number of detectors or x-ray devices purchased. Other implementation costs, such as training, maintenance, and technical support, may not differ from conventional x-ray.

### Organizational Feasibility

*How organizationally feasible is it to implement the health technology/intervention?*

Implementation of a single-exposure, DES flat panel x-ray detector is likely feasible at the hospital level. The initial implementation of retrofitting an existing x-ray system was not a seamless process. Operators of the DES detector reported usability issues that negatively impacted workflow. The images produced by the single-exposure, DES flat panel x-ray detector were perceived as improving confidence in making diagnosis and identifying medical lines placed in the body, though non-users were uncertain of its benefit in a clinical setting and impact on workflow.

# Reference

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- 1) Ontario Health. Single-exposure, dual-energy subtraction flat panel x-ray detectors: a health technology assessment. Ont Health Technol Assess Ser [Internet]. 2024 Nov;24(9):1–76. Available from: [hqontario.ca/evidence-to-improve-care/health-technology-assessment/reviews-and-recommendations/single-exposure-dual-energy-subtraction-flat-panel-x-ray-detectors](https://hqontario.ca/evidence-to-improve-care/health-technology-assessment/reviews-and-recommendations/single-exposure-dual-energy-subtraction-flat-panel-x-ray-detectors)

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