18F-fluorodeoxyglucose positron emission tomography with computed tomography (FDG-PET-CT)

*for oncological indications*

Technology Guidance from the MOH Medical Technology Advisory Committee (MTAC)

### Guidance recommendations

The Ministry of Health’s MTAC has recommended 18F-fluorodeoxyglucose positron emission tomography with computed tomography (FDG-PET-CT) for the management of the following oncological indications:

<table>
<thead>
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<th>All subtypes of the following tumours:</th>
<th>Limited subtypes of the following tumours:</th>
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<tr>
<td>• Cervical cancer</td>
<td>• Central nervous system cancer</td>
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<td>• Colorectal cancer</td>
<td>▪ Suspected residual or recurrent malignant brain cancer</td>
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<td>• Non-small cell lung cancer</td>
<td>▪ Head and neck cancer</td>
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<td>• Solitary pulmonary nodule</td>
<td>▪ Nasopharyngeal cancer</td>
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<td>• Hodgkin’s disease (lymphoma)</td>
<td>▪ Squamous cell carcinomas</td>
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<td>• Non-Hodgkin’s disease (lymphoma)</td>
<td>▪ Salivary gland tumours</td>
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<td>• Melanoma</td>
<td>▪ Sarcoma</td>
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<td>▪ Osteosarcoma</td>
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<td>▪ Rhabdomyosarcoma</td>
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### Subsidy status

FDG-PET-CT subsidies for the abovementioned oncological indications **only apply** to corresponding functions listed in the Annex.

Subsidies **do not** apply to other oncological indications.
Subsidies **do not** apply to PET-CT services utilising non-FDG tracers.

Published on 1 October 2018
Factors considered to inform the recommendations for subsidy

Technology evaluation

1.1 The MOH MTAC (“the Committee”) considered evidence presented for the technology evaluation of FDG-PET-CT for oncological indications. The evaluation was conducted in consultation with an expert work group comprising radiologists and oncologists.

1.2 The evidence was used to inform the Committee’s deliberations around five core decision-making criteria:
   - Clinical need of patients and nature of the condition
   - Clinical effectiveness and safety of the technology
   - Cost-effectiveness (value for money) – the incremental benefit and cost of the technology compared to existing alternatives
   - Estimated annual technology cost and the number of patients likely to benefit from the technology
   - Organisational feasibility, which covers the potential impact of adopting the technology, especially barriers for diffusion

1.3 Additional considerations, such as ethical or social issues related to adoption of the technology, may also be part of the Committee’s deliberations.

Clinical need

2.1 PET is a non-invasive molecular imaging technique that utilises radioactive tracers (e.g. FDG). Unlike other diagnostic modalities used for anatomic imaging such as CT and MRI, PET can detect heightened cellular metabolic activity that might be indicative of tumour cells. PET-CT provides both functional (from PET) and anatomical information (from CT), allowing better characterisation of organs and tissues.

2.2 The Committee noted that FDG-PET-CT could generally be applied to a wide range of oncological indications, mainly for staging and monitoring. FDG-PET-CT has been widely used in local public healthcare institutions for multiple oncological indications. In general, staging was found to be the most commonly used and most useful function for oncological indications.
Clinical effectiveness and safety

3.1 The Committee noted that because of the large amount of evidence available for FDG-PET-CT on multiple oncological indications, the current evaluation was largely based on recommendations from reference international health technology assessment (HTA) agencies such as Canadian Agency for Drugs and Technologies in Health (CADTH), Australian Medical Services Advisory Committee (MSAC), and National Institute for Health and Care Excellence (NICE). This was supplemented by recommendations from the local expert work group.

3.2 Although patients will be exposed to some radiation, FDG-PET-CT is generally considered a safe technology. However, the Committee recognised that the clinical effectiveness of FDG-PET-CT could vary across the different oncological indications and PET-CT functions.

3.3 Referencing international HTA agency recommendations, the Committee concluded that FDG-PET-CT was likely to be effective for managing the oncological indications listed in the Annex. The Committee also concurred with the clinical consensus, developed by the local expert work group, on the use of FDG-PET-CT for the corresponding functions of each oncological indication listed in the Annex.

Cost-effectiveness

4.1 No local economic evaluation was performed to assess the cost-effectiveness of FDG-PET-CT for the different oncological indications.

4.2 The Committee noted that, with the chosen evaluation approach, FDG-PET-CT recommendations were taken from international HTA agencies where cost-effectiveness might have played an integral part of funding considerations.

Estimated annual technology cost

5.1 In 2016, an estimated 2,399 PET-CT scans were performed on subsidised patients in the public healthcare sector PET-CT centres for the recommended oncological indications. Based on the projected maximum capacity in public healthcare sector PET-CT centres, the Committee noted that the total estimated annual cost of subsidising FDG-PET-CT for the recommended indications was $3 million to <$5 million.

5.2 The Committee noted that costs associated with outsourcing FDG-PET-CT service for subsidised patients to the private sector were not considered in the evaluation.
Organisational feasibility

6.1 The projected annual organic growth for PET-CT utilisation is substantial. The Committee noted that there are two PET-CT scanners in the public healthcare sector and they are currently highly utilised. PET-CT capacity in the public healthcare sector is likely to be exceeded in the near future. Furthermore, the Committee agreed that subsidy might lead to even higher PET-CT utilisation.

6.2 The Committee concluded that tapping excess PET-CT capacity in the private sector through outsourcing can be considered, provided:
- the service is reasonably priced;
- the service quality is adequate; and
- the administrative issues associated with outsourcing are addressed.

Additional considerations

7.1 The Committee acknowledged the importance of indication-specific subsidy to optimise the use of public funds. It emphasised that the information technology system in the public healthcare sector should be developed to facilitate implementation of the indication-specific subsidy.

Recommendation

8.1 On the basis of international HTA agency recommendations, the Committee recommends subsidising FDG-PET-CT for the specific oncological indications and corresponding functions listed in the Annex.

About the Agency

The Agency for Care Effectiveness (ACE) is the national health technology assessment agency in Singapore residing within the Ministry of Health. It conducts evaluations to inform the subsidy of treatments, and produces guidance on the appropriate use of treatments for public hospitals and institutions in Singapore. When using the guidance, the responsibility for making decisions appropriate to the circumstances of the individual patient remains with the healthcare professional.

Find out more about ACE at www.ace-hta.gov.sg/about

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### ANNEX: List of oncological indications and functions for FDG-PET-CT subsidy

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<tr>
<th>Indication</th>
<th>Sub-indication</th>
<th>Function</th>
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| **Cervical cancer**              | All sub-indications                         | 1) Initial staging for locally advanced cancer considered for radical chemo-RT or surgery  
2) Response assessment after chemo-RT  
3) Suspected recurrence - to exclude metastatic disease, especially in patients considered for curative surgery involving morbid exenteration  
4) RT planning to define nodal volume coverage  
5) Diagnosis for stage 1B2 to 4  
6) One-time follow up 3-6 months after completing therapy |
| **Central nervous system cancer**| Suspected residual or recurrent malignant brain cancer | 1) Detect or stage relapse  
2) Response assessment |
| **Colorectal cancer**            | All sub-indications                         | 1) Detect relapse in liver and evaluate for curative liver surgery  
2) Restaging for patients considered for radical treatment after detection of apparently solitary or limited metastases  
3) Detection of recurrence in patients with rising tumour markers with equivocal or non-diagnostic imaging such as CT or MRI scans |
| **Head and neck cancer**         | Nasopharyngeal cancer                       | 1) Initial staging  
2) Response assessment particularly to evaluate need for salvage neck surgery after initial radical radiotherapy with or without chemotherapy  
3) Detect or stage relapse |
| **Hodgkin's disease (Lymphoma)** | All sub-indications                         | 1) Initial staging  
2) Response assessment  
3) Detect or stage relapse and/or prior to transplantation |
| **Non-Hodgkin's disease (Lymphoma)** | All sub-indications                        | 1) Initial staging  
2) End of treatment evaluation  
3) Detect or stage relapse and/or prior to transplantation  
4) Clinically suspected transformation of low-grade follicular lymphoma (FL) to diffuse large B-cell lymphoma (DLBCL) |
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| **Non-small cell lung cancer**                 | All sub-indications                                | 1) Initial staging  
2) Response assessment following radical treatment with radiotherapy with or without chemotherapy  
3) RT planning when there is a need to define tumour volume in the presence of atelectasis |
| **Solitary pulmonary nodule**                  | All sub-indications                                | 1) Diagnosis and guide to need for biopsy                                                                                               |
| **Melanoma**                                   | All sub-indications                                | 1) Initial staging for stage III and above  
2) Detect or stage relapse                                                                                                             |
| **Myeloma**                                    | All sub-indications                                | 1) Initial staging  
2) Detect or stage relapse  
3) Response assessment                                                                                                               |
| **Oesophageal and oesophago-gastric junction cancer** | All sub-indications                                | 1) Initial staging when considering suitability for radical treatment including chemo-RT and surgery  
2) Response assessment after neoadjuvant or definitive chemo-RT                                                                         |
| **Ovarian cancer**                             | All sub-indications                                | 1) Initial staging if CT scans are indeterminate  
2) Response assessment following initial therapy  
3) Detect or stage relapse                                                                                                               |
| **Sarcoma**                                    | High/Intermediate grade sarcomas or clinically aggressive sarcomas  
Ewing’s sarcoma  
Osteosarcoma  
Rhabdomyosarcoma | 1) Initial staging  
2) Response assessment, particularly when morbid surgery or aggressive multimodality treatment is considered such as amputation of extremity  
3) Detect or stage relapse                                                                                                               |