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Utilisation of PET-CT in Oesophageal Cancer Management: A Clinician's Perspective

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ABSTRACT

Positron emission tomography-computed tomography (PET-CT) is a hybrid imaging modality that plays a crucial role in detecting and managing oesophageal cancer. However, not much is known about the clinicians' perspective on its usage for oesophageal cancer. The aim of this study is to know the perspective of clinicians on the utilisation of PET-CT imaging for oesophageal cancer patients. A total of 73 clinicians with multidisciplinary clinical specialties for oesophageal cancer management were interviewed. All these clinicians had completed a survey consisting of 31 questions on; practicality, clinical efficacy and cost-effectiveness of PET-CT. The survey used Likert-scale to evaluate the responses. In terms of PET-CT practicality and clinical efficacy 39.7% - 43.8% and 47.9% - 83.5% of the sample respectively responded positively while in with regards to cost effectiveness, there was a significant difference from being neutral to having no opinion in 6 out of 9 questions. It was clear from the study that PET-CT has positive impact in the management of oesophageal cancer patients. However, issues related to expertise, availability, staffing and bureaucracy need to be addressed to improve competency and quality of services.

Keywords: Clinical efficacy, cost effectiveness, PET-CT, practicality

INTRODUCTION

The process of cancer management inclusive of diagnosing, staging, planning and monitoring treatment relies heavily on anatomic imaging using computed tomography (CT) or magnetic resonance imaging (MRI). Anatomic imaging generally has a high sensitivity of up to 47% in detecting clear structural changes but

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inaccurate for differentiating abnormality as either malignant or benign (Barber et al., 2012; Royal College of Radiologist, 2005). PET-CT is a hybrid imaging modality that combines PET and CT technologies in a single scanner. PET images provide information about physiological functions of the body such as cell metabolism, while CT images provide anatomical detail of the patient (Antoch et al., 2003; Heinrich et al., 2005). Development of PET-CT scanner has a big impact in the field of nuclear medicine, particularly in staging cancer (Barber et al., 2012; Briggs, Chowdhury, Lodge, & Scarsbrook, 2011; Lardinois et al., 2003; Yap et al., 2001).

The PET-CT scan is an important diagnostic imaging technique which requires a continuous evaluation to satisfy the needs of clinicians, physicians, radiologists, and other decision makers. The most biggest advantage of PET-CT compared with other modalities is its ability to locate lesion accurately in regard to relationships with neighbouring structures and the presence of local invasion (Bar-Shalom et al., 2003). In terms of its application in oncology, physiological information have been proven to be beneficial for localising complex anatomy (El-Hariri, Gouhar, & Refat, 2012).

New technologies continue to emerge and require health care management to prioritise scarce resources. Reimbursement bodies increasingly require evidence not only for clinical efficacy but also for economic efficiency in order to make rational decisions. Introduction of new technologies in nuclear medicine like PET-CT should be evaluated through clinical efficacy and cost effectiveness. In addition, expenses incurred in the management of patients should be worth the results (Schreyögg et al., 2010). Multiple studies have shown a positive impact of PET-CT in detecting and staging oesophageal cancer (Antoch et al., 2003; Antoch et al., 2004; Bar-Shalom et al., 2003). However, only few researches focused on the clinicians' opinions. This was the first survey conducted in North West to assess the perception of clinicians who have had an important role in the management of patients with oesophageal cancer.

MATERIALS AND METHODS

Population

A total of 496 clinicians from various disciplines having experience in oesophageal cancer management were interviewed to gather their opinions and perceptions on the impact of PET-CT on clinical management of patients in 38 hospitals in North West, UK.

Survey

This is cross-sectional survey using a convenience sampling method. The approval from the North West research ethics board and Royal Liverpool Broadgreen University Hospital Trust (RLBUHT) ethics committee were obtained.

Topic

The survey questionnaire was based on three main topics: practicality, clinical efficacy and cost-effectiveness of PET-CT. It used a 5-point Likert scale, with higher scores representing

a positive impact, ranging from 1 (strong disagreement with the statement) to 5 (strong agreement with statement). Completed questionnaires were then analysed using descriptive statistical analysis.

RESULTS

A total of 134 clinicians responded with a return rate of 27%; 46% of the respondents who had no experience or current clinical practice related to oesophageal cancer management were excluded. The final sample size was 73 respondents (a response rate of 54%). The non-reply form was categorised as missing. The summary of the results is shown in Figure 1 below:

Number	*Ratings*	*0*	*1* *2*	*3*	*4* *5*
	Questions	*No Answer*	*Strongly Disagree / Disagree*	*Neutral / No opinion*	*Agree / Strongly Agree*
Practicality					
Q1	PET-CT studies are easily available to be included in any stage of patient management whenever needed.	1.4%	42.4%	12.3%	43.8%
Q2	PET-CT studies enable the physician to avoid any tests or procedures that are usually will be included as part of the management?	4.1%	35.6%	20.5%	39.7%
Q3	If PET-CT were not available, would you have done some type of alternative assessment in most of the cases?	1.4%	26%	28.8%	43.8%
Clinical Efficacy					
Q4	PET-CT is useful for clinical studies for the detection, staging in clinical management of oesophageal cancer.	1.4%	5.4%	9.6%	83.5%
Q5	PET-CT is useful for clinical studies for follow up on disease progression in clinical management of oesophageal cancer.	1.4%	17.8%	32.9%	47.9%
Q6	PET-CT studies altered the initial course of clinical management for oesophageal cancer.	1.4%	9.5%	12.3%	76.7%
Cost Effectiveness& Service Delivery					
Q7	PET-CT is cost-effective because the modality is precise for staging disease, improve treatment plans and avoid unnecessary treatments for oesophageal cancer	1.4%	9.5%	26%	63.1%
The only drawback to include PET-CT study in patient management is the limitation to its availability due to: (Tick one or more):					
Q8a	Financial Issues	5.5%	23.2%	17.8%	53.4%
Q8b	Availability of Isotopes	4.1%	28.7%	13.7%	53.4%
Q8c	Access to Equipment	8.2%	28.8%	43.8%	19.1%
(Q9a-Q9e)	Shortage of Staff				
Q9a	• PET-CT Technician	8.2%	21.9%	57.5%	12.3%
Q9b	• Reporting Staff (Radiologist, Nuclear Medicine Specialist,etc)	6.8%	30.1%	39.7%	23.3%
Q9c	• End-user staff (Oncologist, Surgeon, etc)	8.2%	34.2%	46.6%	11%
Q9d	Training for staff	8.2%	28.8%	45.2%	17.8%
Q9e	Bureaucracy (e.g.: Long waiting list)	9.6%	24.6%	41.1%	24.6%

Figure 1. Survey shows positive agreements for practicality (min = 39.7%) and clinical efficacy (min = 47.9%) and neutral opinion for cost effectiveness (min = 39.7%)

In 9 out of 15 questions, most of the participants agreed with to the role of PET-CT in cancer management (agree or strongly agree), ranging from 39.7% up to 83.5%. Only 2 questions elicited negative responses (disagree or strongly disagree), ranging from 35.6% to 42.4%. On the topic of practicality and clinical efficacy, the majority of respondents agreed

with the statement (agree or strongly agree) and the lowest percentage of response was ranging from 1.4% to 4.1%. Trend rate analysis for cost- effectiveness was found to be an uncommon finding in comparison to other topics. The majority of responses related to t the availability of PET-CT (6 out of 9 questions) skewed towards neutral or no opinion at all (39.7% - 57.5%) in contrast to questions related in other topics as in practicality and clinical efficacy.

DISCUSSION

Practicality

The majority of clinicians agreed on the on practicality of PET-CT scans. Despite increased demands for PET-CT scans for patients in North West, the practicality for application in clinical practice is still restricted due to the limited availability of this modality within the studied area.

The answers to Question 2 and 3 indicate that PET-CT is generally considered as an additional imaging modality rather than as an alternative to other modalities, thereby it may lead to increased cost. The PET-CT availability has become a key main concern for physicians as most of them suggested that PET-CT studies are not easily accessible to be included at any stage of the oesophageal cancer patient's management. Most of the respondents disagreed that they will forgo any test with the present of PET-CT. This finding indicate that the PET-CT is not the main choice for decision makers to be included as a first line diagnostic test in the clinical management. An introduction of new technologies for diagnostic purpose should be able to prove its ability to give a positive impact on disease management compared with current pathways before it can be considered to be implemented into clinical practice. This new technology should be more clinically effective, fast and cheaper compared with current modalities in practice (Vernon et al., 2008).

The availability of PET-CT in relation to clinical demands is closely related to the high cost associated with it (Antoch et al., 2003). The PET-CT machine cost between £1 million to £2.5 million and there are yearly maintenance costs as well. This prohibitive cost makes it is quite impossible for it to be installed in every hospital, thus requiring proper planning (Royal College of Radiologist, 2005).

Clinical efficacy

For the clinical efficacy topic, this survey has indicated the level of knowledge and understanding of the participants on the current clinical guidelines and research findings. As PET-CT could change the diagnosis that has been confirmed by other tests or screening; it might affect the appropriateness of treatment option and alter the initial course of the clinical management. As a decision maker, clinicians depend on the diagnostic imaging modalities among other tests to decide on the best treatments to be prescribed. Clinicians may offer different treatment option for patient with additional information from PET-CT results.

This integrated imaging modality has an increasingly valuable role in many clinical fields such as cardiology, neurology and oncology with increased sensitivity and specificity compared to other dedicated PET, CT (Antoch et al., 2004; El-Hariri et al., 2012). A positive

agreement with the clinical efficacy topic may be due to the fact that most of the respondents have continually improved their knowledge on latest innovation or intervention introduced in clinical practice nationwide. Improvement of knowledge from training and reading materials could enrich their judgement to have a consensus that this new modality is valuable to be included in oesophageal cancer management.

Cost effectiveness

Potential savings are associated with PET-CT as a result of avoiding additional imaging examinations or invasive procedures and by helping clinicians make the optimum treatment decisions (Saif, Syrigos, Tzannou, & Makrilia, 2010). The benefits of structured cost-effectiveness evaluation include a better utilisation of limited healthcare resources, prevention of diffusion of unproven tests into widespread clinical practice, and withdrawal of diagnostic procedures that cannot be shown to be of value. The current world financial state deems limited financial availability, in which any new procedures or interventions goes beyond its clinical effectiveness before it can be implemented into clinical practice.

There are significant differences in comparison to other topics based on the majority of neutral or no opinion responses. This may be due to the fact that this topic is not something within respondent responsibilities as their expertise is more towards assessment on clinical application and practicality of the imaging procedure. It is in agreement with various studies in which clinicians viewed their clinical responsibilities patient management as taking precedence over strategic management role (Dopson & Stewart, 1993; Dopson, Stewart, & Templeton, 1989; Thomas & Dunkerley, 1999). Implementation of interdisciplinary involvement in strategic management and planning is essential to ensure continuous development of institutions.

Introduction of new technology aside from the need for new staff also brings together the issues of expertise and training of staff assigned to ensure continuous competency and quality of delivered services (Royal College of Radiologist, 2005). Rapid expansion of PET-CT installation worldwide requires a growing number of personnel and specialised training for them in order to keep up with the development of this modality, maintain level of competency and services provided to the patients. Personnel involved include, but is not limited to, the radiologist, nuclear medicine specialist, radiographer, nuclear medicine technologist and specialist nurses.

CONCLUSION

Findings of this study show benefits of this integrated imaging modality may include changes in patient management. This study indicates some new directions for future research as one of the important role of clinicians is to provide the clinical implication reports so that non-clinical decision can be made related to finance and infrastructures by the administrator. This survey will be a benchmark for continuity of future surveys to measure any new intervention or diagnostic procedure in compliance with clinical guidelines and compatibility with current clinical practice. Therefore, a continuous improvement in services, facilities, staffing and overall process of management could be achieved and sustained.

This review showed clinical efficacy and practicality, which include direct facilitation of clinicians expertise knowledge and background exposure, had more positive outcomes than cost effectiveness alone. However, it is unclear whether this is a function of the format of knowledge delivery, the length of expertise experiences of the clinicians and/or the nature of the clinicians-policy maker relationship. Variability between themes in the outcomes measured was also a confounding factor. This study used exclusively cost effectiveness of PET-CT theme despite the fact that the proximal aim of study was to see the impact on cost effectiveness as a whole. Future research should aim to control for some of these confounding variables, as well as including both clinicians and policy makers, in order to gain further insight into the impact of cost effectiveness at the practical level. As previously identified, there is considerable heterogeneity in the nature of different themes evaluated in this study in terms of both clinicians experience and background of expertise. Clearly, this variation introduces multiple confounding variables when comparing results of different themes.

Development of hybrid imaging is an evolution from standalone imaging developed over the past 50 years. This new technology has revolutionised the way older and especially younger generation of clinicians perceive imaging. Hybrid images providing superimposition of radiotracer signals on a set of CT or MRI in oesophageal cancer for instance has become a much preferred visualisation tools for the clinicians.

The PET CT also has aesthetic advantages over side by side data or independent modalities in terms of increased diagnostic accuracy and clinicians' confidence in localising abnormalities. High cost and restricted availability of PET in many parts of the world has made it been generally reserved only for cases with equivocal standalone imaging results. However, in the oesophageal and other oncological cases, major contribution of FDG PET is to avoid futile procedure in patients with positive metastatic from PET results that shows false negative in other standalone imaging modalities irrespective of whether there was any equivocation of these modalities. Hybrid imaging with more precise characterisation of the nature and location of abnormalities is likely to further improve diagnostic performance and thereby, treatment selection and planning. This will not only improve patient care but also reduce cost by avoiding futile treatment interventions, despite the higher upfront cost of the imaging component of the management paradigm if PET-CT and other hybrid imaging tests were used as the primary diagnostic test. There is increasing evidence across a broad range of indications that hybrid PET-CT are usually more accurate that this modality allows when compared with side-by-side comparison of each modality acquired separately. A large and increasing number of studies published on hybrid modalities will continue to inform older and younger generations of clinicians' perspective on clinical efficacy, practicality and cost effectiveness with no doubt of turning back to stand alone modalities. The evolution of hybrid imaging technologies is essential for the future of cancer imaging.

This study gives an insight into the values of clinical, cost effectiveness and practicality from the perspective of clinicians that might influence the administrative power to spend on new modalities or procedures. However, more in-depth research is required to contribute to this study's initial findings on the clinicians' perceived views on PET-CT for oesophageal cancer. Further research exploring the linkages between the clinicians' input on the clinical impact of newer modality and its effect on the administrative spending power decision making is also worthwhile.

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