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Observational study of decision making concerning radiotherapy in rectal cancer

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ABSTRACT

Aim: To understand how surgeons arrive at a decision in the complex and controversial field of radiotherapy in rectal cancer by identifying which variables are important in this decision and to assess the influence of age, training, area of practice and access to radiotherapy on decisions in this field.
Methods: A self-administered survey was distributed to 150 members of the CSSANZ. They were asked to rank the importance of 33 variables considered when making decisions to use radiotherapy in the treatment of rectal cancer. The responses were assessed for association of surgeon age, area of practise or access to radiotherapy with decisions in this field.
Results: A hierarchy of variables was produced which showed tumour characteristics had the highest average importance, higher than that attained by patient characteristics and side effects.
There were subtle but statistically significant differences in the ranking of importance when surgeons were grouped by age, site of subspeciality training, site of practise and availability of radiotherapy service.
Conclusion: This study identifies a hierarchy of variables used in decision making concerning radiotherapy in rectal cancer treatment, which may be used in heuristic decision making.
Decisions on using radiotherapy are influenced by age, site of practise, site of training, and the presence of radiotherapy on site.

1. Introduction

Despite multiple randomized controlled trials, the use of radiotherapy in the treatment of rectal cancer continues to span a broad spectrum from no adjuvant radiotherapy at all, to therapeutic radiotherapy as the definitive treatment [1,2].

The large volumes of evidence required to be incorporated into a decision on when, if, and how, to use radiotherapy in the treatment of rectal cancer can cause uncertainty. The study of decision making under uncertainty dates back to the 18th century [3]. Insight into uncertainty and the impact of bias has been demonstrated in the medical literature [4]. A widely accepted decision making model is the dual system theory [5] which proposes a spectrum between two methods: intuition (System 1) and reasoning (System 2) [6,7]. Intuitive thinking has been described as heuristic and is characterized as being fast, impulsive, and reflexive but error prone [8]. This type of decision making uses cues to minimize mental effort in uncertain and time-pressured environments. The cues used by the decision maker are subject to the individual's preferences. In contrast, reasoning is slow, explicit, deliberate, and thought to be more reliable but can be overwhelmed by large amounts of information. Either mode can override the other but in situations of time pressure the intuitive mode is likely to dominate.

In many countries multidisciplinary team (MDT) decisions determine the patient's treatment course and have become the standard of care [9]. Uncertainty or bias in decision making concerning radiotherapy is thought to be abrogated by the MDT. In team decision making both the leader and the information presented has a significant influence on the process. The leader in MDT is often the surgeon and the decision making process employed by this individual becomes important due to its significant influence the MDT process. In addition, understanding decision making may optimize the MDT process [9,10].

In order to understand how surgeons make a decision in a complex environment, we conducted a survey study aiming to define the important variables that are considered by surgeons

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when making decisions regarding treatment of rectal cancer and assess if such decisions are influenced by age, site of training, location of practice and availability of radiotherapy.

2. Methods

A self-administered survey was developed which asked surgeons to use a Lickert scale to rate the importance of 33 variables relevant to any decisions using radiotherapy in the treatment of rectal cancer. Relevant demographic data was collected and pattern of radiotherapy use was indicated.

Ethical approval was obtained from the Sydney South West Area Health Service Ethics Review Committee, Royal Prince Alfred Hospital zone.

The survey was distributed to the surgeons of the Colorectal Surgical Society of Australia and New Zealand (CSSANZ). The responses were statistically analysed using IBM SPSS Statistics Version 19™. The importance of the 33 variables was assessed using medians and minimum and maximum scores. The variables were also analysed in one of the following categories: tumour characteristics, external influences, treatment outcomes, patient characteristics, and side effects. The individual surgeon's response to each variable in these categories was used to calculate a mean category score.

Wilcoxon Signed Rank test was used to assess for significant differences between the importances assigned to the variables. The Friedman test was used for comparing differences between responses to 3 or more variables and post hoc analysis with Wilcoxon Signed Rank test if a *P*-value of less than 0.05 was calculated. A Bonferroni adjustment was made to the level of significance to control for a Type 1 error.

The groups used for further univariate analysis were age ($\leq$49 or $\geq$50 years of age), location of subspeciality training (Within or outside Australia), main practise location (quaternary/tertiary referral centre or peripheral/rural centres) and access to radiotherapy (with or without radiotherapy service located in their main hospital). Statistically significant differences ($P < 0.05$) between demographic groups were assessed using Mann Whitney U univariate analysis.

Effect size statistic (r) was estimated by dividing the z value by the square root of the total number of cases in the group. The Cohen criteria were used for effect size: 0.1 = small effect, 0.3 = medium effect and 0.5 = large effect.

3. Results

152 surgeons were sent the questionnaire and 107 (70%) responded, of which 105 were eligible.

3.1. Overall importance assigned to variables

The variables assigned greatest importance (Md = 10) were '*tumour stage*' and a '*desire to reduce local recurrence*'. The next most important variables (Md = 9) were '*desire to downstage tumour to maximise chance of resection with clear radial margins*', '*staging with MRI*', '*tumour at lower third of rectum*' and '*evidence supporting radiotherapy*'. The two variables allocated least importance, with a median of 1, were '*downstage tumour to allow transanal excision of early cancer*' and '*to permit a wait and see approach*' (Table 1).

Overall, the highest ranking variable with direct subjective patient impact was '*desire to avoid functional bowel problems*' which had a median importance of 7, but 12 other variables were assigned greater median importance in the decision making on radiotherapy in the treatment of rectal cancer (Table 1).

Table 1
Overall ranking of variables as assigned by 105 CSSANZ surgeons.

Variable	Min	Median	Max
Tumour stage	2	10.0	10
Desire to reduce rate of local recurrence	4	10.0	10.0
Desire to downstage tumour to maximise chance of resection with clear radial margins	8.0	9.0	10.0
Staging with MRI	8.0	9.0	10.0
Tumour at lower third of rectum	8.0	9.0	10.0
Evidence supporting radiotherapy	8.0	9.0	10.0
Nodal status	7.0	8.0	10.0
Distance of tumour from anal verge	7.0	8.0	9.0
Tumour at middle third of rectum	7.0	8.0	9.0
Downstage tumour to allow resection	6.0	8.0	9.0
Consensus of MDT	6.0	8.0	9.0
Desire to maximise overall survival	3.3	7.5	10.0
Tumour position	5.0	7.0	9.0
Your personal experience or observations	5.0	7.0	8.0
Desire to avoid functional bowel problems	5.0	7.0	8.0
Experience, observations and opinions of colorectal surgical colleagues	4.3	7.0	8.0
Your patient's ASA	4.0	7.0	8.0
The policy of your colorectal surgery unit toward radiotherapy	3.0	6.0	8.0
Your patient's age	4.0	6.0	8.0
Presence of resectable metastatic disease	4.0	5.5	8.0
Desire to minimise chance of long term pelvic pain	3.0	5.0	8.0
Access to radiotherapy service	2.0	5.0	8.0
Desire to downstage tumour in order to preserve anal sphincter	2.0	5.0	8.0
Desire to avoid urinary problems	3.0	5.0	7.0
Desire to minimise chance of sexual dysfunction	3.0	5.0	7.0
Desire to minimise chance of pelvic sepsis	2.0	4.0	6.0
Desire to minimise chance of wound infection	2.0	3.5	5.8
Staging with transanal ultrasound	0	3.5	8.0
Desire to avoid permanent stoma	2.0	3.0	6.8
Tumour at upper third of rectum	1.0	3.0	6.0
Patient's gender	0	2.0	5.0
Downstage tumour to allow transanal excision of early cancer	0	1.0	3.0
To permit a 'wait and see' approach	0	1.0	2.0

3.2. Differences between categories

When the CSSANZ surgeons' responses were considered in categories (Table 2), it is interesting to note that the average importance given to the "side effects" category is significantly less than the average for the "tumour characteristics" category (4.9 vs. 7.0, $t(104) = 11.19$, $P < 0.001$ (two-tailed)). The "tumour characteristics" category had the highest average importance, significantly higher than "external influences" (95% CI from 0.1 to 0.7, $t(104) = 2.79$, $P = 0.01$).

3.3. Differences between demographic groups

103 surgeons completed the questions related to demographics and radiotherapy practise. There were statistically significant differences between the median (Md) importance placed on variables by different groups of surgeons.

Surgeons aged less than 50 years ($n = 56$) assigned a statistically significant higher median importance to tumour stage, than surgeons aged 50 or more ($n = 47$) (10 vs. 9, $P = 0.04$). However, the effect size was small ($r = 0.2$). Younger surgeons placed greater importance on '*desire to minimise sexual dysfunction*' compared to older surgeons (5 vs. 4, $P = 0.03$). Older surgeons placed slightly more importance on '*to permit a wait and see approach*' than younger surgeons (1 vs. 0.5, $P = 0.03$).

Surgeons whose colorectal surgery training occurred within Australia ($n = 61$) placed more importance on '*patient gender*' than those trained outside of Australia ($n = 42$) (3 vs. 1, $P = 0.05$).