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Research Dissemination Reports

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Health and Health Services Research Fund

Research Dissemination Reports

Editorial

Dissemination reports are concise informative reports of health-related research supported by funds administered by the Food and Health Bureau, for example the *Health and Health Services Research Fund* (which was consolidated into the *Health and Medical Research Fund* in December 2011). In this edition, 12 dissemination reports of projects related to cancer, economics, neurology, paediatrics, and wound care are presented. In particular, three projects are highlighted due to their potentially significant findings, impact on healthcare delivery and practice, and/or contribution to health policy formulation in Hong Kong.

As the incidence of breast cancer increases in Hong Kong, the numbers of women treated for and surviving the disease also increase. Fielding and Lam[1] conducted a 6-year follow-up of a cohort of Hong Kong Chinese women who underwent surgery for primary early-stage breast cancer to document the prevalence and nature of residual difficulties faced by women. They found that although most women make a reasonable recovery, psychosocial morbidity can persist for many years following breast cancer surgery. Close supportive social relationships seem to benefit, whereas residual impacts on women's body image and perceived sexuality persist. Residual treatment symptoms seem to be significant barriers to resuming normal life for these women.

Previous research suggests that long-lasting neurotoxicity of general anaesthetics may lead to postoperative mental disturbance. Brain function monitoring, such as the bispectral (BIS) index, facilitates anaesthetic titration and has been shown to reduce anaesthetic exposure. In a randomised controlled trial, Chan and Gin[2] tested the effect of BIS monitoring on mental functioning after surgery in elderly patients undergoing major colorectal procedures. When anaesthesia was adjusted to maintain a BIS value between 40 and 60 during surgery, 30% less anaesthetic was delivered. This resulted in a 28% reduction in the relative risk of developing delirium during initial hospitalisation and postoperative cognitive dysfunction at 1 and 6 months after surgery.

Swabbing during wound cleansing is no longer encouraged. Irrigation is now encouraged as it loosens debris, removes excess exudates and reduces bacterial colonisation without traumatising the wound bed and impeding the healing process. Mak et al[3] conducted a multicentre, prospective, randomised controlled trial in four out-patient clinics in Hong Kong to compare the two cleansing methods on wound healing. Compared with swabbing, wound cleansing by irrigation was more cost-effective in shortening the healing time of wounds. Patients presented less pain during wound cleansing and had higher satisfaction in terms of comfort after wound cleansing and on the cleansing method itself. There was no clinically important difference in the variation of wound infection rates between two groups.

A research impact evaluation was conducted 2 years after the project end date for all of the studies reported in this supplement. Impact was assessed through knowledge generation, capacity building, and influence on health policy and health care practices.

We hope you will enjoy this selection of research dissemination reports. Electronic copies of these dissemination reports and the corresponding full reports can be downloaded individually from the Research Fund Secretariat website (http://www.fhb.gov.hk/grants). Researchers interested in the funds administered by the Food and Health Bureau also may visit the website for detailed information about application procedures.

Supplement co-editors

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Oral mucositis in paediatric patients after chemotherapy for cancer

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KEY MESSAGES

1. Oral mucositis (OM) is common among paediatric patients receiving chemotherapy.

2. Paediatric patients who are neutropaenic, with high levels of anxiety, or with a history of OM have a greater risk and an earlier onset of OM.

3. OM has negative effects on clinical outcomes and the patient's life, including on oral function and quality of life.

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Introduction

Oral mucositis (OM) can aggravate the paediatric patients' clinical condition and elicit multiple debilitating oral symptoms that irrevocably alter patients' quality of life.[1,2] Nonetheless, the full spectrum of pathogenesis and factors in the development of OM remains poorly understood, in particular in the paediatric cancer population. This study aimed to determine the factors associated with OM in paediatric patients undergoing chemotherapy for cancer, and to compare the outcomes in paediatric patients with and without OM.

Methods

This was a multi-centre, prospective, observational cohort study conducted from November 2007 to November 2009 in a university-affiliated hospital and two regional hospitals in Hong Kong. This study was approved by the Institutional Review Boards of the hospitals, and was conducted in accordance with the Declaration of Helsinki. Written informed parental consent was obtained for each subject before enrolment. A total of 88 boys and 52 girls aged 6 to 18 (mean, 11.8; standard deviation [SD], 3.3) years who underwent stomatotoxic chemotherapy for cancer were recruited through convenience sampling. Most (56%, n=78) were diagnosed with haematological malignancies, and most (28%, n=39) were treated with adriamycin-based chemotherapy.

Subjects were asked to use a daily diary to complete the Chinese version of the mouth and throat soreness (MTS)-related questions of the Oral Mucositis Daily Questionnaire from the start of chemotherapy (day 1) to day 14, the Chinese version of the State Anxiety Scale for Children on day 1, and the Oropharyngeal Mucositis Quality of Life Scale (OMQoL) at baseline, day 7, and day 14. Demographic and clinical data were collected from interviews and subjects' medical records. Binary and ordinal logistic regression analyses were used to assess the relation between potential factors and risk of OM occurrence. The Cox proportional hazards regression model was used to determine the effect of potential factors on time in days to onset of OM. Differences in proportions of subjects manifesting adverse clinical and patient-reported outcomes between subjects with, and without OM and by severity of OM were compared using the Chi-square test, one-way ANOVA, and multi-level modelling techniques.

Results

Incidence, onset, and severity of oral mucositis

Overall, 41% (n=57) of paediatric patients developed OM (Table 1). Of these, 23% (n=32) reported a maximum MTS score of 2 (non-severe OM), and 18% (n=25) reported a maximum MTS score of 3-4 (severe OM). The mean time to onset of OM was 4.7 (SD, 2.7; range, 2-9; 95% confidence interval [CI], 4.0-5.4) days after the start of chemotherapy, with a mean duration of 6.3 (SD, 4; range, 1-13; 95% CI, 5.2-7.4) days and with the peak at day 7.5 (SD, 2.6; range, 4-11; 95% CI, 6.8-8.2). The mean area under the curve (AUC) MTS score across 14 days was 16.9 (SD, 6.5; range, 2.5-28.5; 95% CI, 15.1-18.6).

TABLE 1. Characteristics of paediatric patients with or without oral mucositis (OM) after chemotherapy

Variable	No. (%) of patients		
	Absence of OM (mouth and throat soreness [MTS] score of<2) [n=83]	Presence of OM (MTS score of ≥2) [n=57]	Total (n=140)
Age (years)			
6-12	43 (51.8)	32 (56.1)	75 (53.6)
13-18	40 (48.2)	25 (43.9)	65 (46.4)
Gender			
Boys	53 (63.9)	35 (61.4)	88 (62.9)
Girls	30 (36.1)	22 (38.6)	52 (37.1)
Education level (n=135)			
Primary 1-3	17 (21.2)	6 (10.9)	23 (17)
Primary 4-6	34 (42.5)	19 (34.5)	53 (39.3)
Secondary 1-3	19 (23.8)	21 (38.2)	40 (29.6)
Secondary 4-7	10 (12.5)	9 (16.4)	19 (14.1)
Cancer diagnosis			
Solid tumours	42 (50.6)	20 (35.1)	62 (44.3)
Haematological malignancies	41 (49.4)	37 (64.9)	78 (55.7)
Cancer regimen			
Etoposide-based regimen	15 (18.1)	3 (5.3)	18 (12.9)
Methotrexate-based regimen	11 (13.3)	14 (24.6)	25 (17.9)
Cytarabine-based regimen	9 (10.8)	4 (7.0)	13 (9.3)
Adriamycin-based regimen	22 (26.5)	17 (29.8)	39 (27.9)
Other anthracycline-based regimen	7 (8.4)	6 (10.5)	13 (9.3)
Combined etoposide, methotrexate, cytarabine and/or adriamycin regimen	19 (22.9)	13 (22.8)	32 (22.9)

Factors associated with oral mucositis

Paediatric patients with and without OM were similar with regard to age, gender, oral care, traditional Chinese medicine consumption, renal functional status, use of growth factor, and extent of nausea and vomiting (P>0.25, Table 2). Paediatric patients with OM were more likely to have haematological malignancies and a low consumption of sweet food than those without OM (P<0.25). The univariate analysis revealed that a history of OM, a higher level of anxiety, ≥1 neutropaenia, and ≥1 liver toxicity significantly increased the risk of developing OM (P<0.05).

A history of OM, sweet food consumption, anxiety, cancer diagnosis, absolute neutrophil count, and aspartate aminotransferase to alanine aminotransferase ratio all had values of P<0.25 in the univariate models and were included as candidate variables for the multivariate model, adjusting for potential confounding factors of the chemotherapy regimen. In the multivariate model, only a history of OM (adjusted odds ratio [OR], 3.94; 95% CI, 1.49-10.39), a higher level of anxiety (adjusted OR, 1.46; 95% CI, 1.23-1.73), and grade 1-2 (adjusted relative risk [RR], 4.59; 95% CI, 1.81-11.66) and 3-4 (adjusted RR, 9.19; 95% CI, 1.83-46.29) neutropaenia were significantly associated with a higher probability of

OM, after controlling for the chemotherapy regimen (P<0.01).

The AUC MTS score was categorised into three ordinal subgroups of 0 (n=55), 1-11.5 (n=39), and ≥12 (n=46). The results of these subgroups were consistent with the binary logistic regression model. A history of OM (adjusted OR, 2.43; 95% CI, 1.14-5.18, P=0.02), a higher level of anxiety (adjusted OR, 1.37; 95% CI, 1.20-1.55, P<0.001), and grade 1-2 (adjusted OR, 2.93; 95% CI, 1.41-6.10, P=0.004) and 3-4 (adjusted OR, 8.69; 95% CI, 2.12-35.69, P=0.003) neutropaenia were significantly associated with a higher category of AUC MTS, after adjusting for the chemotherapy regimen. These variables were also independent predictors of the time in days to the onset of OM, after controlling for chemotherapy. On Cox regression analysis, the hazard ratios of a history of OM and anxiety were 1.90 (95% CI, 1.01-3.59, P=0.04) and 1.27 (95% CI, 1.18-1.37, P<0.001), respectively. The hazard ratios of grade 1-2 and 3-4 neutropaenia were 1.86 (95% CI, 1.08-3.07, P<0.01) and 3.08 (95% CI, 2.27-6.40, P<0.01), respectively.

Oral mucositis and its related activity limitations

The incidence of a maximum MTS-activity limitations score of 2 (non-severe limitations) and

TABLE 2 Factors associated with oral mucositis (OM)

Factors	Absence of OM (mouth and throat soreness [MTS] score of <2) [n=83]	Presence of OM (MTS score of ≥2) [n=57]	Bivariate analysis (unadjusted OR [95% CI])	P value	Multivariate binary logistic analysis* (adjusted OR [95% CI])	P value
Patient-related						
Age (years) [No. (%) of patients]						
6-12	43 (51.8)	32 (56.1)	1.0 (reference)	0.614	-	-
13-18	40 (48.2)	25 (43.9)	0.84 (0.43-1.65)			
Gender (No. [%] of patients)						
Male	53 (63.9)	35 (61.4)	1.0 (reference)	0.768	-	-
Female	30 (36.1)	22 (38.6)	1.11 (0.55-2.23)			
Cancer diagnosis (No. [%] of patients)						
Solid tumours	42 (50.6)	20 (35.1)	1.0 (reference)			
Haematological malignancies	41 (49.4)	37 (64.9)	1.90 (0.95-3.8)	0.069	-	-
A history of OM (No. [%] of patients)						
No	51 (61.4)	25 (43.9)	1.0 (reference)	0.040	3.94 (1.49-10.39)	0.006
Yes	32 (38.6)	32 (56.1)	2.04 (1.03-4.05)			
Multivariate ordinal logistic analysis to predict area under the curve (AUC) MTS groups					2.43 (1.14-5.18)	0.02
Cox proportional hazards regression analysis to predict the days to onset of OM (hazard ratio [95% CI])					1.90 (1.01-3.59)	0.04
No. of tooth brushing per day in the first 5 days (mean±SD [range])	1.34±0.6 (1.20-1.48)	1.46±0.6 (1.28-1.63)	1.35 (0.78-2.31)	0.282		
No. of saline rinsing per day in the first 5 days (mean±SD [range])	0.98±1.3 (0.69-1.30)	1.23±1.4 (0.86-1.60)	1.15 (0.90-1.47)	0.278		
Days of sweet food consumption in the first 5 days (mean±SD [range])	1.86±1.7 (1.49-2.22)	1.46±1.6 (1.04-1.87)	0.86 (0.69-1.06)	0.155	-	-
Days of traditional Chinese medicine consumption in the first days (mean±SD [range])	0	0	-			
Anxiety level (mean±SD [range])	15.48±2.9 (14.84-16.11)	18.18±3.4 (17.29-19.08)	1.33 (1.17-1.51)	<0.001	1.46 (1.23-1.73)	<0.001
Multivariate ordinal logistic analysis to predict AUC MTS groups					1.37 (1.20-1.55)	<0.001
Cox proportional hazards regression analysis to predict the days to onset of OM (hazard ratio [95% CI])					1.27 (1.18-1.37)	<0.001
Treatment-related						
Cancer regimen (No. [%] of patients)						
Etoposide-based regimen	15 (18.1)	3 (5.3)	0.29 (0.07-1.21)	0.091	0.28 (0.05-1.54)	0.143
Methotrexate-based regimen	11 (13.3)	14 (24.6)	1.86 (0.65-5.36)	0.251	1.80 (0.44-7.27)	0.412
Cytarabine-based regimen	9 (10.8)	4 (7.0)	0.65 (0.17-2.56)	0.538	0.34 (0.05-2.52)	0.288
Adriamycin-based regimen	22 (26.5)	17 (29.8)	1.13 (0.44-2.91)	0.801	0.89 (0.24-3.21)	0.853
Other anthracyclines-based regimen	7 (8.4)	6 (10.5)	1.25 (0.34-4.59)	0.734	2.31 (0.39-13.57)	0.355
Combined etoposide, methotrexate, cytarabine and/or adriamycin regimen	19 (22.9)	13 (22.8)	1.0 (reference)			
Neutropaenia (109/L) [No. (%) of patients]						
Grade 0 (≥2)	54 (65.1)	11 (19.3)	1.0 (reference)			
Grade 1-2 (1-1.9)	9 (10.8)	16 (28.1)	3.74 (1.75-8.01)	0.001	4.59 (1.81-11.66)	0.001
Grade 3-4 (<0.5-0.9)	20 (24.1)	30 (52.6)	6.24 (1.87-20.79)	0.003	9.19 (1.83-46.29)	0.007
Multivariate ordinal logistic analysis for grade 1-2 neutropaenia to predict AUC MTS groups					2.93 (1.41-6.10)	0.004
Multivariate ordinal logistic analysis for grade 3-4 neutropaenia to predict AUC MTS groups					8.69 (2.12-35.69)	0.003
Cox proportional hazards regression analysis for grade 1-2 neutropaenia to predict the days to onset of OM (hazard ratio [95% CI])					1.86 (1.08-3.07)	<0.01
Cox proportional hazards regression analysis for grade 3-4 neutropaenia to predict the days to onset of OM (hazard ratio [95% CI])					3.08 (2.27-6.40)	<0.01
Liver toxicity (IU/L) [No. (%) of patients]						
Grade 0 (≤1.25)	37 (44.6)	8 (14.0)	1.0 (reference)			
Grade 1-2 (1.26-5)	37 (44.6)	34 (59.6)	4.25 (1.74-10.40)	0.002	-	-
Grade 3-4 (5.1- >10)	9 (10.8)	15 (26.3)	7.71 (2.50-23.76)	<0.001	-	-
Renal toxicity (µmol/L) [No. (%) of patients]						
Grade 0 (≤1.25 x10⁶)	83 (100)	57 (100)	Not estimable	-		
Acute emetogenicity [No. (%) of patients]						
Day 1						
Grade 0 (without nausea & vomiting)	59 (71.1)	40 (70.2)	1.0 (reference)			
Grade 1-2 (nausea only to vomiting 1-5 episodes/day)	23 (27.7)	17 (29.8)	1.09 (0.52-2.30)	0.820		
Grade 3-4 (vomiting ≥6->10 episodes/day)	1 (1.2)	0	0	1.00		
Day 2						
Grade 0 (without nausea & vomiting)	53 (63.9)	40 (70.2)	1.0 (reference)			
Grade 1-2 (nausea only to vomiting 1-5 episodes/day)	25 (30.1)	14 (24.6)	1.26 (0.28-5.58)	0.763		
Grade 3-4 (vomiting ≥6->10 episodes/day)	5 (6.0)	3 (5.3)	0.93 (0.19-4.50)	0.932		
Use of cytokine anytime in the first 5 days (No. [%] of patients)						
No	81 (97.6)	56 (98.2)	1.0 (reference)	0.793	-	-
Yes	2 (2.4)	1 (1.8)	0.72 (0.06-8.17)			

* Likelihood ratio test for the overall model (Chi-square=56.48, P<0.001)

a maximum MTS-activity limitations score of 3-4 (severe limitations) in swallowing, drinking, eating, speaking, and sleeping resulting from OM ranged from 18% (n=25) to 35% (n=49). Approximately 39% (22 out of 57) of paediatric patients with OM reported at least two simultaneous non-severe or severe activity limitations, and 25% (14 out of 57) reported having all five non-severe or severe activity limitations resulting from OM simultaneously. Between 64% and 80% (n=16-20) of paediatric patients with severe OM reported severe oral activity limitations. The presence of severe sleeping problems resulting from OM was reported in 60% (n=15) of paediatric patients with severe OM.

Oral mucositis and quality of life

All OMQoL subscale scores of paediatric patients with an AUC MTS of ≥12 were significantly lower than those with an AUC MTS of 0 or 1-11.5 at all the time points (P<0.001). All OMQoL subscale scores of all three AUC MTS subgroups varied significantly between days 1, 7, and 21 (P<0.001). Of those with an AUC MTS of ≥12, 41% (n=19) to 85% (n=39) had a drop in the OMQoL subscale scores to at least 10 points from the baseline, respectively.

Oral mucositis and clinical outcomes

A weight loss of ≥2 kg was common among paediatric patients with a maximum MTS of 3-4 (30%, n=7) or an AUC MTS of ≥12 (21%, n=9) [Table 3]. The mean weight loss increased with increasing maximum MTS

or AUC MTS score, reaching a mean loss of 1.64 (SD, 0.5) kg and 1.50 (SD, 1.0) kg in paediatric patients with a maximum MTS of 3-4 and AUC MTS of ≥12, respectively. In addition, for paediatric patients with a maximum MTS of 3-4 or AUC MTS of ≥12, fluid replacement, analgesic use, and oral or intravenous antibiotics were more common (P<0.001). Fever also increased with increasing maximum MTS or AUC MTS scores. No difference was observed for oral or systemic infections among the subgroups. None of the paediatric patients had dose modification, dose delay, or hospitalisation due to OM.

Discussion

The incidence of OM in paediatric patients receiving chemotherapy was moderately high (41%). Factors significantly associated with an increased incidence, early onset, and severe OM included a history of OM, severe neutropaenia, and a high anxiety level; this relationship was independent of the type of chemotherapy. These factors may play a role in the aetiology of OM in a synergistic manner, reflecting the multifactorial nature of OM. The higher ORs of neutropaenia suggest that it may be the most important risk factor. This finding is consistent with our understanding of indirect cytotoxicity and the biological process involved in the pathogenesis of OM.[2] A decrease in the neutrophil count may result in an impaired ability to protect against oral mucosal damage, and may affect the proliferation of oral epithelial cells.[3] In

TABLE 3. Relationship between the severity of oral mucositis (OM) and clinical outcomes

Variable	Absence of mucositis	Presence of mucositis		P value	Area under curve (AUC) MTS			P value
	Mouth and throat soreness (MTS) score of ≤1 (n=83)	MTS score of 2 (n=32)	MTS score of 3-4 (n=25)		0 (n=55)	1-11.5 (n=39)	≥12 (n=46)	
Weight loss of ≥2kg (n=90)								
No. (%) of patients	5 (13.2)	5 (17.9)	7 (30.4)	0.246	1 (5.0)	7 (25.9)	9 (21.4)	0.171
Mean±SD (range)*	0.63±1.4 (0.17-1.09)	1.30±0.9 (0.95-1.65)	1.64±0.5 (1.41-1.87)	0.002	-0.16±1.4 (-0.81-0.49)	1.44±0.6 (1.27-1.62)	1.50±1.0 (1.09-1.91)	<0.001
Supportive care (No. [%] of patients)								
Fluid replacement (n=137)	30 (37.5)	16 (50.0)	22 (88.0)	<0.001	12 (21.8)	21 (53.8)	35 (76.1)	<0.01
Oral or intravenous antibiotics (n=129)	54 (68.4)	21 (75.0)	20 (90.9)	0.103	33 (62.3)	24 (68.6)	38 (92.7)	0.003
Use of analgesics	2 (2.4)	20 (62.5)	21 (84.0)	<0.001	1 (1.8)	9 (23.1)	33 (71.7)	<0.001
Hospitalisation for OM	0	0	0	-	0	0	0	-
Associated conditions (No. [%] of patients)								
Dose delay	0	0	0	-	0	0	0	-
Dose modification	0	0	0	-	0	0	0	-
Fever (n=139)	21 (25.0)	9 (28.0)	18 (72.0)	<0.001	10 (18.2)	15 (39.5)	23 (50.0)	0.003
Oral or systemic infections (n=139)	5 (6.1)	2 (6.2)	5 (20.0)	0.130	2 (3.6)	4 (10.5)	6 (13.0)	0.218

* Post-hoc comparisons of mean weight loss: MTS scores of 3-4 and 2 were significantly higher than MTS score of ≤1, whereas AUC MTS of ≥12 and 1-11.5 were significantly higher than AUC MTS of 0

addition, neutropaenic patients are at increased risk for microbial colonisation of damaged mucosal surfaces, resulting in increased pro-inflammatory cytokines in oral mucosa, which may aggravate OM.[2] Nevertheless, neutropaenia is largely non-modifiable and therefore there is limited opportunity to intervene in the aetiopathophysiological process and the development of OM and thus limited direct clinical value in this finding. Consequently, routine assessment of neutrophil level prior to commencement of chemotherapy for high-risk groups is important for aggressive prophylactic OM intervention and treatment, or to consider adjustments to the target dosage of chemotherapy to prevent the occurrence and severity of OM.

The independent effect of a history of OM is plausible, considering the genetic susceptibility factors in the inflammatory response which influences cytokine expression and the mucosal ulcerative process, and hence individual predisposition to OM in each cycle of chemotherapy, but this risk factor is non-modifiable. Nevertheless, this association warrants further studies. Our findings suggested that an increased anxiety level was a risk factor for OM. It is probable that oral immunologic function and pro-inflammatory cytokine levels are influenced by anxiety.[4] Avoidance of this risk factor by psycho-educational or cognitive-behavioural intervention may allay some of the increase in incidence and severity of OM. In this study, we did not observe an independent effect of peak liver toxicity on OM in the final model, despite univariate associations. Age, gender, creatinine value, acute emetogenicity, and use of growth factor were not significantly associated with OM, nor were oral care, sweet food, or traditional Chinese medicine consumption.

The prevalence of a multitude of co-existing oral functional limitations reported by paediatric patients with OM was 39%, suggesting that OM is a symptomatic and comorbid condition.[5] Eating and swallowing difficulties were the most severe oral functional limitations during OM, probably related to the potentially compromised muscular movement during swallowing, resulting from mouth and throat soreness, which made eating and swallowing unpleasant. Severe sleeping problems resulting from OM were reported in 60% of paediatric patients with severe OM. The mechanism by which OM influences patients' sleeping is possibly due to intense mouth/throat pain and drooling.

Most paediatric patients with severe OM recorded a drop in the OMQoL subscale scores to at least 10 points from the baseline. The reduction in body weight associated with OM was significant, probably owing to decreased intake and nutritional deficiencies resulting from mouth/throat pain and difficulty in swallowing. In addition, fluid replacement, analgesic usage, and the administration of oral or intravenous antibiotics were significantly associated with severe OM. Contributing to the increased use of fluid replacement and analgesics in patients with severe OM is the combination of pain and oral symptoms that compromise muscular movement, making chewing and swallowing difficult and unpleasant, and thereby reducing patients' will and desire to eat and drink. Fever also increased with an increasing severity of OM; such an association may be attributed to neutropaenia and infections.

Conclusions

Paediatric patients who are neutropaenic, with a history of OM, or with high levels of anxiety have a higher incidence of OM, an earlier onset, and more severe OM. They often suffer a multitude of intense and debilitating impairments of oral function, and sleeping difficulties.

Acknowledgements

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Psychosocial and physical outcomes after surgery for breast cancer: a 5-to-6-year follow-up

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K E Y   M E S S A G E S

Psychosocial morbidity can persist for many years following breast cancer surgery. Most women make a reasonable recovery. Close supportive social relationships are beneficial, although a residual impact on women's body image and perceived sexuality persists. Residual treatment symptoms are significant barriers to resuming normal life for these women.

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Introduction

Most studies on outcomes after breast cancer surgery focus on disease-free or overall survival and the effectiveness of therapeutic oncology regimens.[1-3] A few studies assess behavioural or psychological dimensions, either the effectiveness of different psychological interventions[4] or the impact of behaviour such as presentation delay on 5-year survival.[5] The 5-year survival for early-stage breast cancer often exceeds 70% and for stage IIIa disease exceeds 50%.[3] The incidence of breast cancer in Hong Kong is increasing.[6] This study aimed to document the prevalence and nature of residual difficulties faced by women who had undergone breast cancer surgery.

Methods

This study was conducted from October 2007 to December 2008. Of 338 women recruited after undergoing breast cancer surgery between 2001 and 2002, 218 women completed the 8-month follow-up and the 5-to-6-year follow-up (Table 1). They were interviewed through telephone after a mean of 69.6 (standard deviation [SD], 5.9) months, using a standardised structured questionnaire to measure psychological distress (Chinese Health Questionnaire [CHQ12]), anxiety and depression (Hospital Anxiety and Depression Scale [HADS]), optimism (Chinese- Life Orientation Test-Revised [C-LOT-R]), and social morbidity (Chinese Social Adjustment Scale [ChSAS]), as well as the arm and breast symptoms subscale from the European Organization for Research and Treatment of Cancer (EORTC) quality-of-life scale, and satisfaction with outcomes. Multivariate regression analysis adjusting for confounders was performed.

Results

Of the 218 women, most reported having arm (lymphoedema) [71%, n=62] or breast (65%, n=76) symptoms, which were most troublesome to younger and working women, despite low symptom intensity. Few women met the criteria for anxiety (5.5%) or depression (6.4%). Compared with levels before surgery, levels of social functioning after surgery were comparable in terms of family relationships, better in terms of friends' relationships, and worse in terms of self-image, enjoyment of social activities, and attractiveness & sexuality (Table 2). Correlations were found between 6-year follow-up outcome variables and 8-month follow-up and baseline scores, including distress and physical symptoms. To adjust for differences in age and other factors (treatment, staging, and demographics), multivariate regression analysis indicated concurrent breast and arm symptom scores, optimism (C-LOT-R), and 8-month post-surgery CHQ12 were associated with 6-year follow-up distress (CHQ12) scores. Anxiety (HADS-A scores) was associated with concurrent optimism, breast symptoms, age, and occupation, and 8-month distress (Table 3). Depression (HADS-D scores) was associated with optimism, occupation, age, and 8-month distress (Table 3). Social morbidity predictors included 8-month levels of each social morbidity category, 8-month distress (family, self-image), disease stage (family), optimism (family, friends, self-image, attractiveness & sexuality), marital status (friends), and baseline treatment decision-making difficulties (sexuality) [Table 4].

Discussion

Despite reasonably good recovery after breast

TABLE 1. Characteristics of the 218 patients

Characteristic	No. (%) of patients
Mean±SD age (years)	56.7±9.1
Marital status	
Single	21 (9.6)
Married/co-habiting	158 (72.5)
Divorced/separated	17 (7.8)
Widowed	22 (10.1)
Education level	
No formal education	13 (6.0)
Primary	81 (37.2)
Secondary	97 (44.5)
Tertiary	27 (12.4)
Total monthly household income (HK$)	
<10 000	61 (28.0)
10 001-20 000	76 (34.9)
20 001-30 000	28 (12.8)
30 001-40 000	20 (9.2)
>$40 000	18 (8.3)
Missing	15 (6.9)
Occupation	
Employed	72 (33.0)
Retired	56 (25.7)
Housewife	84 (38.5)
Unemployed	6 (2.8)
Living arrangement	
Living alone	12 (5.5)
Living with family/significant others	206 (94.5)
Mean±SD time since diagnosis (months)	70.8±6.2
Mean±SD time since surgery (months)	69.6±5.9
Stage of disease	
0	33 (15.1)
I	51 (23.4)
II	107 (49.1)
III	13 (6.0)
IV	1 (0.5)
Missing	13 (6.0)
Type of surgery	
Breast-conserving therapy	53 (24.3)
Modified radical mastectomy	152 (69.7)
Modified radical mastectomy and breast reconstruction	13 (6.0)
Current adjuvant therapy	
Hormonal therapy	45 (20.6)
Chemotherapy	2 (0.9)
Recurrence	
Yes	11 (5.5)
No	204 (93.6)
Missing	2 (0.9)

TABLE 2. Questionnaire scores at the 5-to-6-year follow-up (n=218)

	Possible range of scores	Mean±SD (range)
Chinese Social Adjustment Scale*		
Family relationship	10-50	32.56±4.3 (18.47-48.0)
Body image	7-35	19.80±1.9 (12-25)
Relationship with friends	7-35	22.06±2.6 (12.85-30.38)
Enjoyment of social activities	4-20	12.08±1.4 (4-17)
Attractiveness & Sexuality	5-25	13.66±2.4 (5-21)
Optimism (Chinese- Life Orientation Test-Revised)	6-24	15.75±2.3 (9-24)
Optimism	3-12	8.49±1.4 (5-12)
Pessimism	3-12	7.33±1.4 (3-12)
Psychological distress (Chinese Health Questionnaire)†	0-36	8.41±4.6 (0-23)
Hospital Anxiety and Depression Scale†	0-42	8.08±5.6 (2-29)
Anxiety	0-21	3.66±3.5 (0-16)
Depression	0-21	4.42±2.7 (1-17)
Perceived self-efficacy (General Self-Efficacy Scale)*	10-40	26.42±4.8 (12-40)
European Organization for Research and Treatment of Cancer		
Arm symptoms†	0-100	15.95±16.6 (0-100)
Breast symptoms†	0-75	7.68±7.8 (0-37.5)

* Higher scores indicate better outcome
† Lower scores indicate better outcome

cancer surgery, persistent psychological morbidity may remain. Social morbidity was apparent in body image and attractiveness & sexuality aspects of social function. Relationships with others were generally as good or better (with friends) than those before diagnosis. Treatment decision-making difficulties continued to show an impact on scores relating to perceived sexuality.

Distress at 8-months post-surgery was the most prevalent predictor of psychological and physical symptoms after 5 to 6 years. Distress at 8 months is strongly influenced by treatment decision-making difficulties, pessimistic outlook, poor early (baseline) psychological status, and physical symptom distress.[7] The association between treatment decision-making difficulties, poor early adjustment, and subsequent physical symptom distress is well documented, as is the association with disappointment with outcomes and optimism.[7]

TABLE 3. Multiple regression analysis for predictors of psychological and social morbidity

Variable	β	SE	P value
Psychological morbidity			
Chinese Health Questionnaire (CHQ12)			
Breast symptoms	0.309	0.036	<0.001
Optimism (Chinese- Life Orientation Test-Revised) [C-LOT-R]	-0.295	0.110	<0.001
8-month postop distress (CHQ12)	0.223	0.044	<0.001
Arm symptoms	0.150	0.017	0.013
Self-efficacy (General Self-Efficacy Scale)	-0.129	0.053	0.020
Hospital Anxiety and Depression Scale (HADS): anxiety			
Optimism (C-LOT-R)	-0.256	0.087	<0.001
Breast symptoms	0.216	0.026	<0.001
8-month postop distress (CHQ-12)	0.222	0.035	<0.001
Age	-0.212	0.022	<0.001
Occupation	-0.196	0.400	0.001
Self-efficacy (General Self-Efficacy Scale)	-0.151	0.043	0.011
Type of surgery	-0.135	0.482	0.018
HADS: depression			
Optimism (C-LOT-R)	-0.306	0.070	<0.001
8-month postop distress (CHQ-12)	0.216	0.029	0.001
Occupation	-0.174	0.328	0.004
Age	-0.170	0.018	0.006
Breast symptoms	0.155	0.021	0.013
Type of surgery	-0.133	0.390	0.027
Social morbidity			
Chinese Social Adjustment Scale (ChSAS): family relationships			
8-month family relationships (ChSAS)	0.350	0.062	<0.001
8-month distress (CHQ-12)	-0.188	0.046	0.003
Stage of disease	0.160	0.977	0.011
C-LOT-R	0.153	0.118	0.018
ChSAS: friend relationships			
8-month friend relationships (ChSAS)	0.215	0.060	<0.001
C-LOT-R	0.215	0.073	0.001
Marital status	-0.182	0.372	0.005
Arm symptoms	0.146	0.010	0.025
Occupation	0.144	0.341	0.027
ChSAS: self-image/appearance			
8-month self-image/appearance (ChSAS)	0.248	0.059	0.001
C-LOT-R	0.198	0.055	0.003
8-month distress (CHQ-12)	-0.179	0.024	0.016
Occupation	0.135	0.256	0.037
ChSAS: sexuality			
C-LOT-R	0.211	0.065	0.001
Baseline treatment decision-making difficulties	-0.184	0.032	0.006
8-month self-image/appearance (ChSAS)	0.150	0.074	0.058
8-month sexuality (ChSAS)	0.164	0.074	0.035

Physical side effects interacted significantly with psychosocial state and resulted in high levels of psychosocial morbidity for up to 6 years. Psychosocial distress at 8 months was associated with poorer subsequent family relationships. Early treatment decision-making difficulties were associated with poor perceived attractiveness & sexuality. Types of surgical treatment influenced changes in family, body image, and attractiveness & sexuality domains of the ChSAS in the 8 months following surgery.

Although only 75% of women completed the 5-to-6-year follow-up, a good indication of the experiences of these women was captured. The cross-sectional components of the study make it difficult to disentangle the influences of psychological state from physical symptoms. The interaction between women's psychosocial status and their physical symptoms from treatments persisted for many years following diagnosis. Some of this psychosocial morbidity may have been minimised if women were assisted to adjust before primary treatment. Attention should be paid to helping women who are single and younger and who lack the benefit of a close supportive network of friends and family.

Conclusions

Psychosocial morbidity can persist for many years following breast cancer surgery. Most women make a reasonable recovery. Close supportive social relationships are beneficial, although a residual impact on women's body image and perceived sexuality persists. Residual treatment symptoms are significant barriers to resuming normal life for these women.

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Cost-effectiveness of *Helicobacter pylori* screening and treatment for gastric cancer in Hong Kong: a decision analytic approach

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KEY MESSAGES

1. A state-transition Markov model was developed to evaluate the cost-effectiveness of *Helicobacter pylori* screening and treatment in Hong Kong Chinese people, and to evaluate the uncertainty surrounding choice of strategies and the value of further research on the decision to initiate a mass screening programme.

2. A decision analytic framework and a societal perspective were adopted. The least costly and non-dominated strategy was *H pylori* serologic testing, followed by treating those positive for *H pylori*, with no follow-up testing. Its incremental cost-effectiveness ratio was US$20 547 for men and HK$26 840 for women per life year saved or US$17 886 for men and HK$23 905 for women per quality-adjusted life year (QALY) saved, compared with no screening or treatment.

3. *H pylori* screening and treatment could be cost-effective based on the threshold of US$50 000 per QALY.

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Introduction

In Hong Kong, gastric cancer is the fourth leading cause of cancer-related death following lung, colorectum, and liver cancer. Eradication of *Helicobacter pylori* may reduce the incidence of gastric cancer.[1] This study estimated the cost-effectiveness of *H pylori* screening and treatment in Hong Kong Chinese people, and evaluated the uncertainty surrounding choice of strategies and the value of further research on the decision to initiate a mass screening programme.

Methods

Study instruments and cost-effectiveness analyses

This study was conducted from December 2009 to November 2011. A state-transition Markov model was developed to simulate *H pylori* screening and treatment as well as gastric cancer diagnosis and treatment in Hong Kong Chinese people aged 20 years for the next 60 years. Participants were followed up throughout their lifetime. Disease progression could vary by *H pylori* status, sex, and age.

According to a gastric carcinogenesis model,[2] the natural history of non-cardia intestinal-type gastric adenocarcinomas was characterised as a progression of yearly transitions among various health states (Fig), including normal gastric mucosa, gastritis, gastric atrophy, intestinal metaplasia, dysplasia, early gastric cancer, distant gastric cancer, death from gastric cancer, and death from other causes. A cohort of individuals were distributed to either *H pylori*–positive or *H pylori*–negative precancerous health states. They could remain in one state or transit to other states at rates according to local-specific data and/or consensus from the literature. A cohort of 100 000 cancer-free 20-year-old people over a 60-year span was modelled. It was assumed that gastric cancer deaths could only occur in those in the metastatic state.

It was assumed that the effectiveness of *H pylori* treatment depends on the absence of advanced precancerous lesions and that treatment reduces disease progression probabilities in those with gastritis and atrophy.[3-5] Our model was based on a randomised controlled trial in a Japanese population evaluating the effectiveness of *H pylori* treatment to prevent (metachronous) cancers among early gastric cancer patients after endoscopic mucosal resection.[1]

Three strategies were evaluated: (1) no screening or treatment, (2) *H pylori* serologic testing, followed by treating those positive for *H pylori*, with no follow-up testing, (3) *H pylori* serologic testing, followed by treating those positive for *H pylori*, and confirming *H pylori* eradication using a C-urea breath test, and retreating those who were positive.

Four major direct medical costs were considered: the cost of screening for *H pylori*, the cost of treatment for *H pylori*, the one-time cost of invasive
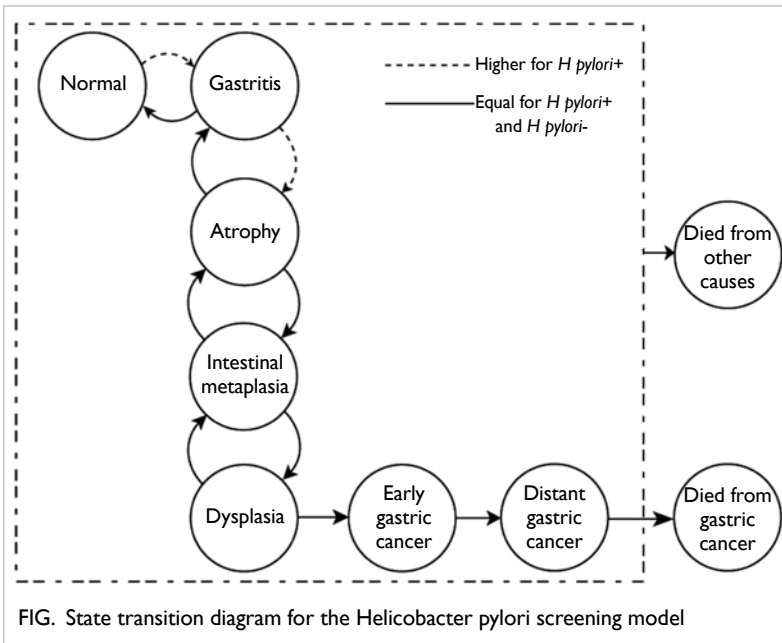
FIG. State transition diagram for the Helicobacter pylori screening model

Strategies that were less effective and more costly than a competing strategy were eliminated by simple dominance. Comparative performance of the remaining screening strategies was measured by the incremental cost-effectiveness ratio (ICER). Those that were less effective and had a higher ICER were ruled out by extended dominance and eliminated, and the ICERs of the remaining strategies were recalculated.

A societal perspective was adopted. Recommendations of the Panel on Cost-Effectiveness in Health and Medicine were used in performing cost-effectiveness calculations.

Sensitivity analysis

A probabilistic sensitivity analysis was conducted to examine uncertainty surrounding choice of strategies. Clinical and cost parameters were specified with appropriate probabilistic distributions, and cost-effectiveness results associated with selecting values at random from the distributions were used in a Monte Carlo simulation of the model with 1000 runs. Based on the simulated cost-effectiveness results, a cost-effectiveness acceptability curve was constructed to present the uncertainty of the ICER across different values of the ceiling ratios (ie acceptability willingness-to-pay thresholds).

The uncertainty that potentially existed in decision and the model parameters in value of information analyses were assessed. That is, the uncertainty surrounding choice of strategies and whether further research could add value to the decision of initiating a population-wide screening programme were evaluated, as was the expected value of perfect information (EVPI) for the entire cost-effectiveness model.[6]

cancer treatment, and the cost of terminal care during the final 6 months before death. The cancer treatment cost included diagnosis (eg endoscopy), major surgical procedure (eg gastrectomy), hospitalisation after surgery, chemotherapy, and staff costs. The first-line treatment for *H pylori* (a 14-day course of proton pump inhibitor, clarithromycin, and amoxicillin) was used. The costs of treatment were estimated based on per unit/month drug price and fees and charges in a public hospital. The terminal costs were calibrated according to the trajectory of US cancer costs. Other major non-health care costs were also considered, including transportation and time costs. All costs were adjusted to the 2012 level.

TABLE. *Helicobacter pylori* screening and treatment strategies for a cohort of 100 000 Hong Kong Chinese people aged 20 years for the next 60 years*

Strategy*	Projected total mortality in the next 60 years	Projected gastric cancer-related mortality in the next 60 years	Lifetime costs (million US$)	Life years	Incremental cost-effectiveness ratio†	
					Cost per life year saved	Cost per quality-adjusted life year saved
Men						
No screening or treatment	95 100	814	23.73	5 970 700		
Screening and treatment	95 091	773	35.03	5 971 250	20 547	17 886
Screening, treatment, and rescreening	95 088	759	54.03	5 971 432	104 463	90 712
Women						
No screening or treatment	86 962	520	14.99	6 546 824		
Screening and treatment	86 955	494	26.29	6 547 245	26 840	23 905
Screening, treatment, and rescreening	86 953	486	45.29	6 547 375	146 341	130 239

* Assuming health-related utilities of 0.9 and 0.3 for early and advanced invasive cancer for the remaining time spent in the same state
† Relative to the less costly, non-dominated strategy above

Results

Cost-effectiveness and associated uncertainty

Compared with no screening or treatment, screening and treatment for *H pylori* resulted in a gain in life expectancy of 1.2 to 2 days at an incremental cost of US$113 to US$303 per person (Table). The most cost-effective (non-dominated) strategy was *H pylori* serologic testing, followed by treating those positive for *H pylori*, with no follow-up testing. Its ICER was US$20 547 for men and HK$26 840 for women per life year saved or US$17 886 for men and HK$23 905 for women per quality-adjusted life year (QALY) saved, compared with no screening or treatment. In probabilistic sensitivity analyses, the probability of the ICER being below a threshold of US$50 000 per life year saved was 51.9% for men and 50.7% for women.

Expected value of perfect information

The results of the model were subject to limited uncertainty (cost per man/woman=US$825/US$790). The EVPI for the patient populations was estimated to be US$13.4 million over 40 years if a willingness-to-pay threshold was US$50 000 per life year saved.

Discussion

The most cost-effective strategy was *H pylori* serology testing, followed by antibiotic treatment for those positive, with no follow-up testing. The probability sensitivity analyses and the EVPI analyses showed the robustness of the results by considering several dimensions of uncertainty. The state-transition model captured the natural history of non-cardia intestinal-type gastric adenocarcinoma, and reflected the role of *H pylori* infection in the pathogenesis of gastric cancer.

A potential limitation of this study was that we did not have aggregate local stage-specific treatment costs for invasive gastric cancer, and instead relied on individual itemised cost data. In addition, we did not evaluate the full spectrum of screening strategies for *H pylori* (eg screening at different ages).

This mathematical decision analytic model could provide insight about the long-term outcomes and the cost-effectiveness of *H pylori* screening and treatment strategies.

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Association between HLA–B*15:02 allele and antiepileptic drug–induced severe cutaneous reactions in Hong Kong Chinese: a population-based study

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K E Y   M E S S A G E

HLA-B*15:02 was strongly associated with carbamazepine-induced Stevens-Johnson syndrome/toxic epidermal necrolysis.

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Introduction

The presence of HLA-B*15:02 allele greatly increases the risk of carbamazepine-induced severe cutaneous adverse drug reactions, namely Stevens-Johnson syndrome (SJS) and toxic epidermal necrolysis (TEN).[1,2] It is unknown whether HLA-B*15:02 also confers increased risk of SJS/TEN induced by other anti-epileptic drugs (AEDs). HLA-B*15:02 in single cases of SJS/TEN is reported to be induced by phenytoin and lamotrigine.[1,3] This study examined the association between HLA-B*15:02 allele and SJS/TEN induced by different AEDs.

Methods

This case-control study was conducted from March 2010 to September 2011. Ethics approval was obtained from five Hospital Authority clusters. Written informed consent was obtained from each patient. Medical records of 25 male and 30 female Han Chinese patients aged 10 to 85 (mean, 44.1; standard deviation [SD], 17.1) years who presented with SJS/TEN from 1 January 1993 to 30 June 2009 within 12 weeks after commencing AEDs of carbamazepine (n=27), phenytoin (n=15), valproate (n=3), phenobarbital (n=2), lamotrigine (n=6), gabapentin (n=1), and levetiracetam (n=1) were reviewed using the Clinical Data Analysis and Reporting System.

From a DNA bank of over 1800 Han Chinese epilepsy patients, 275 controls aged 10 to 90 (mean, 44.1; SD, 16.9) years who were tolerant to AEDs after taking them for at least 3 months without developing skin rash were identified. Cases and controls were matched in age and AED prescribed in the ratio of 1:5.

DNA collected from blood and saliva samples were extracted using QIAamp DNA kit (Qiagen, Hilden, Germany) and Oragene DNA Self-Collection Kit (DNA Genotek, Ottawa, Canada), respectively. HLA-B*15:02 was detected by sequence-based typing. In brief, polymerase chain reaction was performed with primers spanning exon 2 to 3 of the HLA-B region. DNA sequencing was performed using ABI 3730xl DNA sequencer (Applied Biosystems, Foster City [CA], USA) and the resulting sequences were analysed using SBTengine (GenDx, Utrecht, The Netherlands).

Based on estimation from previous results,[1] the combined frequency of HLA-B*15:02 was assumed to be 15% in controls and 49% in cases. The sample size would have 90% power to detect a difference in frequency between cases and controls at P=0.001. Pearson Chi-square test or Fisher's exact test was used to compare the frequencies of HLA-B*15:02 between cases and controls. To account for multiple comparisons, a P value of <0.001 after Bonferroni correction was considered statistically significant.

Results

There was sample error in one case and one control, and thus only 54 cases and 274 controls were analysed. HLA-B*15:02 was associated with AED-induced SJS/TEN (63.0% of cases vs 15.3% of controls; $P=3.38 \times 10^{-14}$; odd ratios [OR]=9.39; 95% confidence interval [CI], 4.94-17.86; Table). Specifically, HLA-B*15:02 was associated with carbamazepine-induced SJS/TEN (92.3% [24/26] of cases vs 11.9% [16/135] of controls; $P=3.51 \times 10^{-18}$; OR=89.25; 95% CI, 19.25-413.83). HLA-B*15:02 was also found in 46.7% (7/15) of phenytoin-induced

TABLE. Associations between HLA-B alleles and anti-epileptic drug–induced Stevens-Johnson syndrome/toxic epidermal necrolysis

Anti-epileptic drug	HLA-B allele	No. (%) of participants		P value*	OR (95% CI)
		Cases	Controls		
All		(n=54)	(n=274)		
	B13:01	11 (20.4)	34 (12.4)	0.120	1.81 (0.85-3.84)
	B15:01	3 (5.6)	11 (4.0)	0.710	1.41 (0.38-5.22)
	B15:02	34 (63.0)	42 (15.3)	3.38×10^{-14}	9.39 (4.94-17.86)
	B15:25	1 (1.9)	4 (1.5)	1.000	1.27 (0.14-11.62)
	B35:01	2 (3.7)	8 (2.9)	0.672	1.28 (0.26-6.20)
	B38:02	8 (14.8)	31 (11.3)	0.468	1.36 (0.59-3.15)
	B40:01	6 (11.1)	66 (24.1)	0.035	0.39 (0.16-0.96)
	B46:01	8 (14.8)	69 (25.2)	0.100	0.52 (0.23-1.15)
	B51:01	3 (5.6)	9 (3.3)	0.425	1.73 (0.45-6.62)
	B51:02	4 (7.4)	8 (2.9)	0.117	2.66 (0.77-9.17)
	B54:01	1 (1.9)	10 (3.6)	1.000	0.50 (0.06-3.97)
	B55:02	1 (1.9)	14 (5.1)	0.480	0.35 (0.05-2.72)
	B56:01	2 (3.7)	7 (2.6)	0.646	1.47 (0.30-7.26)
	B58:01	2 (3.7)	51 (18.6)	0.007	0.17 (0.04-0.71)
Carbamazepine		(n=26)	(n=135)		
	B13:01	6 (23.1)	14 (10.4)	0.099	2.59 (0.89-7.54)
	B15:01	1 (3.8)	4 (3.0)	0.591	1.31 (0.14-12.22)
	B15:02	24 (92.3)	16 (11.9)	3.51×10^{-18}	89.25 (19.25-413.83)
	B15:25	0 (0)	3 (2.2)	1.000	-
	B35:01	0 (0)	3 (2.2)	1.000	-
	B38:02	2 (7.7)	15 (11.1)	1.000	0.68 (0.14-3.11)
	B40:01	1 (3.8)	42 (31.1)	0.004	0.09 (0.01-0.68)
	B46:01	3 (11.5)	32 (23.7)	0.168	0.42 (0.12-1.49)
	B51:01	2 (7.7)	2 (1.5)	0.123	5.54 (0.74-41.26)
	B51:02	0 (0)	4 (3.0)	1.000	-
	B54:01	1 (3.8)	5 (3.7)	1.000	1.04 (0.12-9.29)
	B55:02	0 (0)	8 (5.9)	0.356	-
	B56:01	0 (0)	3 (2.2)	1.000	-
	B58:01	2 (7.7)	26 (19.3)	0.256	0.35 (0.08-1.57)
Phenytoin		(n=15)	(n=74)		
	B13:01	2 (13.3)	12 (16.2)	1.000	0.80 (0.16-3.98)
	B15:01	2 (13.3)	1 (1.4)	0.072	11.23 (0.95-133.03)
	B15:02	7 (46.7)	15 (20.3)	0.047	3.44 (1.08-11.00)
	B15:25	1 (6.7)	1 (1.4)	0.310	5.21 (0.31-88.38)
	B35:01	1 (6.7)	3 (4.1)	0.529	1.69 (0.16-17.46)
	B38:02	4 (26.7)	11 (14.9)	0.271	2.08 (0.56-7.73)
	B40:01	2 (13.3)	13 (17.6)	1.000	0.72 (0.15-3.59)
	B46:01	2 (13.3)	22 (29.7)	0.338	0.364 (0.08-1.75)
	B51:01	0 (0)	3 (4.1)	1.000	-
	B51:02	2 (13.3)	3 (4.1)	0.196	3.64 (0.55-23.97)
	B54:01	0 (0)	3 (4.1)	1.000	-
	B55:02	1 (6.7)	1 (1.4)	0.310	5.21 (0.31-88.38)
	B56:01	1 (6.7)	2 (2.7)	0.429	2.57 (0.22-30.33)
	B58:01	0 (0)	16 (21.6)	0.063	-
Lamotrigine		(n=6)	(n=30)		
	B13:01	1 (16.7)	4 (13.3)	1.000	1.30 (0.12-14.21)
	B15:01	0 (0)	2 (6.7)	1.000	-
	B15:02	2 (33.3)	4 (13.3)	0.256	3.25 (0.44-23.95)
	B15:25	0 (0)	0 (0)	-	-
	B35:01	1 (16.7)	1 (3.3)	0.310	5.80 (0.31-108.60)
	B38:02	0 (0)	4 (13.3)	1.000	-
	B40:01	0 (0)	5 (16.7)	0.564	-
	B46:01	1 (16.7)	6 (20.0)	1.000	0.80 (0.08-8.19)
	B51:01	1 (16.7)	3 (10.0)	0.535	1.80 (0.15-20.99)
	B51:02	2 (33.3)	0 (0)	0.024	-
	B54:01	0 (0)	2 (6.7)	1.000	-
	B55:02	0 (0)	3 (10.0)	1.000	-
	B56:01	1 (16.7)	0 (0)	0.167	-
	B58:01	0 (0)	6 (20.0)	0.561	-

* Pearson Chi-square test or Fisher's exact test (two-sided) is used. For each drug, P<0.004 (0.05/14) is considered statistically significant after adjusting for multiple comparisons of 14 HLA-B types using Bonferroni correction

SJS/TEN (P=0.047; OR=3.44; 95% CI, 1.08-11.00), 33.3% (1/3) of valproate-induced SJS/TEN (P=1.000; OR=1.38; 95% CI, 0.10-19.64), and 33.3% (2/6) of lamotrigine-induced SJS/TEN (P=0.256; OR=3.25; 95% CI, 0.44-23.95). There was no HLA-B*15:02 in patients with phenobarbital-, gabapentin-, or levetiracetam-induced SJS/TEN.

There were trend associations of HLA-B*58:01 with AED-induced SJS/TEN (P=0.007; OR=0.17; 95% CI, 0.04-0.71) and HLA-B*40:01 with carbamazepine-induced SJS/TEN (P=0.004; OR=0.09; 95% CI, 0.001-0.68), but the associations were not significant after correction for multiple comparisons (Table).

Discussion

HLA-B*15:02 is associated with AED-induced SJS/TEN among Han Chinese people in Hong Kong.[1] The US Food and Drug Administration recommends HLA-B*15:02 allele testing in the ethnic groups at risk.[4] The Hospital Authority has adopted this recommendation in Hong Kong since September 2008.

In a study of a Han Chinese population from Taiwan, HLA-B*15:02 was associated with phenytoin-induced SJS/TEN (P=0.0041; OR, 5.1; 95% CI, 1.8-15.1), lamotrigine-induced SJS/TEN (P=0.1266; OR, 5.1; 95% CI, 0.8-33.8), and oxcarbazepine-induced SJS/TEN (P=0.00084; OR, 80.7; 95% CI, 3.8-1714.4).[3] In a study from Mainland China, a trend was associated with lamotrigine-induced SJS/TEN (P=0.239; OR, 10.0; 95% CI, 0.44-228.7).[5] Physicians should be cautious in prescribing aromatic AEDs (not only carbamazepine) to patients with HLA-B*15:02 allele.

In our study, HLA-B*58:01 and HLA-B*40:01 were less commonly found in patients with AED-induced SJS/TEN and with carbamazepine-induced SJS/TEN, respectively. A similar pattern for HLA-B*40:01 has been reported in a Taiwan study for carbamazepine-induced SJS/TEN (P=0.00026; OR, 0.16; 95% CI, 0.1-0.4).[1] However, there is a possibility that the lower percentage of HLA-B*40:01 found may be masked by the dominantly associated HLA-B*15:02 allele in carbamazepine-induced SJS/TEN patients.

Acknowledgements

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Neurocognitive and psychosocial outcomes of obstructive sleep apnoea in Hong Kong Chinese

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KEY MESSAGES

1. Patients with obstructive sleep apnoea (OSA) had a number of neurocognitive deficits including attention lapses, working memory, verbal learning and recall, semantic fluency, and processing speed.

2. Psychological impairments including sleepiness and poor sleep quality, depressive, anxiety, and stress symptoms, poor functional outcomes and quality of life were noted in patients with OSA, compared with healthy controls.

3. This study serves as a potential first step in enhancing health care for patients with OSA in Hong Kong by establishing a neurocognitive and psychosocial profile and by identifying relevant daytime outcomes for treatment efficacy evaluation.

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Introduction

Obstructive sleep apnoea (OSA) is the most common sleep disorder causing excessive daytime sleepiness, affecting 2% of females and 4% of males in the middle-aged workforce in Hong Kong.[1,2] This study aimed to investigate the functioning of individuals with OSA using a systematic paradigm of working memory, thereby establishing a cognitive and psychosocial profile of Hong Kong Chinese with OSA in comparison to western populations.

Methods

Individuals aged 30 to 70 years who presented at the Sleep Disorders Centre of the Queen Mary Hospital with (1) a diagnosis of moderate to severe OSA (Apnea-Hypopnea Index [AHI] of ≥15 per hour) using standardised overnight polysomnography,[3] and (2) subjective symptoms of non-restorative sleep as indicated by excessive daytime sleepiness, fatigue, or functional impairment were recruited. Those who were excluded had (1) concurrent diagnoses of other sleep pathologies or significant medical condition or procedure (eg chronic obstructive pulmonary disease, active phase of cancers) or neurological disorder, past head injury with loss of consciousness, any other neurological conditions associated with cognitive impairment; (2) current alcohol or drug abuse (self-report); (3) a history of or current severe psychiatric illness that began >10 years before the diagnosis of OSA; and (4) current use of medication that could affect cognitive function (eg psychotropics, benzodiazepines).

Age- and education-matched controls were recruited from the community. Those with the above exclusion criteria and (1) evidence of sleep pathology or disorder based on a clinical interview, and (2) evidence of having high risk for OSA as indicated by responses on the Berlin Questionnaire using the recommended cut-off score[4] were excluded.

All participants filled out questionnaires of subjective sleep quality, sleepiness, and psychosocial measures, and were tested on the neurocognitive tests. All tests were conducted in Cantonese, and all translated tests had been validated in Chinese populations.

Daytime sleepiness was assessed using the self-administered, 8-item Epworth Sleepiness Scale.[5-7] Sleep quality and disturbances over a 1-month interval was assessed using the self-rated Pittsburgh Sleep Quality Inventory.[8] Neuropsychological tests[9] and working memory tasks[10] including the two storage systems: the phonological loop and visuospatial sketchpad, and the attentional controller (the central executive) were assessed; the verbal and spatial storage capacity of working memory was assessed using the Digit Span and Spatial Span of the Wechsler Memory Scale-Third Edition,[11] whereas the maintenance and online processing functioning of the central executive of working memory were assessed using a spatial n-back task.[12,13] Mood symptoms were assessed using the 21-item Depression Anxiety Stress Scales.[14,15] The Profile of Mood States[16] was used to separate somatic

symptoms (sleepiness, fatigue) from affective symptoms. The effects of sleep disturbances were assessed using the Functional Outcomes of Sleep Questionnaire.[17] The sleep apnoea-specific health-related quality of life was assessed using a validated Chinese version of the Calgary Sleep Apnea Quality of Life Index.[18]

The OSA and control groups were compared using *t*-tests. A significance level of 0.01 was set to reduce type I error owing to multiple comparisons. Hierarchical regressions were used to explore predictors for neuropsychological outcomes.

Results

The OSA and control groups were comparable on age ($t(53)=0.61$, P=0.546), education level ($t(53)=0.226$, P=0.822), and gender ratio ($\chi^2 (1)=4.771$, P=0.041), but the OSA group had higher body mass index ($t(32)=3.505$, P=0.001), Epworth Sleepiness Scale score ($t(53)=10.59$, P<0.001), and Pittsburgh Sleep Quality Index global score ($t(53)=2.632$, P=0.011) [Table 1].

Neurocognitive functioning

Compared with healthy controls, patients with OSA

had more (attention) lapses on the Psychomotor Vigilance Test, performed worse on the learning trials, immediate recall, and total recall of the Rey Auditory Verbal Learning Test, on the speed of naming colours and reading colour names of the Stroop Test, and on both semantic trials of the Fuld Verbal Fluency Test. For the working memory tasks, patients with OSA scored lower on the Backward Spatial Span, and had longer reaction times on the 0-back condition of the spatial n-back task. The effect sizes (Cohen's d) for all significant differences were large (>0.8) [Table 2].

Psychosocial functioning

Compared with healthy controls, patients with OSA had higher scores in all three subscales of the Depression Anxiety Stress Scales, higher fatigue-inertia and more confusion-bewilderment on the Profile of Mood States, lower total score and all subscales on the Functional Outcomes of Sleep Questionnaire, and lower quality of life on the Calgary Sleep Apnea Quality of Life Index. The effect sizes (Cohen's d) for all significant differences were very large (>1) [Table 3].

Predictors of neuropsychological functioning

Hierarchical regression analyses were conducted to explore the predictors of neurocognitive and psychosocial functioning in the OSA group. None of the regression coefficients, including those of the demographic variables were significant (P>0.05).

Discussion

Compared with healthy controls, patients with OSA performed significantly worse (with large effect sizes) on tasks of vigilance, working memory, verbal learning and recall, semantic fluency, and processing speed, but had comparable general intellectual functioning. These findings were consistent with those on western samples, except that the western samples had more pervasive deficits on working memory (2-back accuracies) and executive measures (eg Trail Making Test, Mazes) and less problems with verbal immediate recall.[19-21] Nonetheless, our patients with OSA showed difficulties on the Backward Spatial Span, learning trials and semantic fluency on the Rey Auditory Verbal Learning Test, all of which require intact executive functioning. The lack of significant differences on other tests could be due to less exposure to psychological testing in general and computer tasks in the middle-aged population in Hong Kong, hence weaker performance in our healthy controls than western populations.

Patients with OSA showed higher level of depressive, anxiety, and stress symptoms, more fatigue and confusion, poorer functional outcomes, and lower quality of life. These findings concur

TABLE 1. Demographics and sleep variables of the obstructive sleep apnoea (OSA) and healthy control groups

Variable	Mean±SD	
	OSA (n=25)	Controls (n=30)
Age (years)	50.05±8.44	48.49±10.27
Education (years)	11.36±3.79	11.62±4.50
No. of females:males	4:21	13:17
Body mass index (kg/m²)	28.72±5.82*	23.43±5.26
Sleepiness (Epworth Sleepiness Scale)	16.88±4.11	5.77±3.67
Sleep Quality (Pittsburgh Sleep Quality Index)		
Global score	7.12±3.63*	4.97±2.40
Subjective sleep quality	1.56±1.04	1.10±0.31
Sleep latency	0.80±0.91	0.97±0.72
Sleep duration	0.92±0.76	0.70±0.75
Sleep efficiency	0.92±1.29	0.53±0.86
Sleep disturbance	1.48±0.71	1.07±0.52
Daytime dysfunction	1.36±1.04*	0.60±0.56
Total sleep time (minutes)	406.08±42.76	-
Sleep efficiency (%)	82.27±8.71	-
% of stage 1 sleep	13.34±5.48	-
% of stage 2 sleep	59.66±11.89	-
% of stages 3 and 4 sleep	9.23±9.71	-
Apnea-Hypopnea Index	50.45±21.70	-
Minimum oxygen saturation	70.28±12.05	-

* P<0.01

TABLE 2. Neuropsychological outcomes of the obstructive sleep apnoea (OSA) and healthy control groups

Variable	Mean±SD		t(df=53)	P value	Effect size (d)
	OSA group (n=25)	Controls (n=30)			
General intelligence					
Raven's Standard Progressive Matrices	43.87±9.23	45.53±12.43	0.538	0.593	-0.13
Attention & working memory					
Psychomotor Vigilance Test (PVT) mean response time (RT) [ms]	338.09±55.09	323.05±63.00	0.111	0.912	0.24
PVT lapses (RT>3 sec)	3.84±4.91	0.13±0.34	3.989	<0.001	10.91
Digit Vigilance Test (DVT) mean RT	355.38±121.4	321.50±51.85	1.376	0.175	0.65
DVT errors	8.17±8.79	5.17±6.50	1.433	0.158	0.46
Digit symbol	77.64±16.00	83.97±18.52	1.341	0.186	0.34
Digit span forward	13.36±3.26	14.43±1.36	1.641	0.107	0.79
Digit span backward	7.72±3.53	9.17±2.73	1.713	0.092	0.53
Spatial span forward	8.28±2.39	9.70±2.18	2.301	0.025	0.65
Spatial span backward	7.60±2.35	9.27±1.93	2.893	0.006	0.87
Spatial 0-back RT (ms)	722.51±178.19	604.54±145.02	4.183	<0.001	0.81
Spatial 0-back accuracy (%)	87.76±15.62	87.02±16.24	0.265	0.792	0.05
Spatial 2-back RT (ms)	1057.49±260.09	953.43±279.48	1.634	0.109	0.37
Spatial 2-back accuracy (%)	76.92±13.22	74.10±18.02	0.369	0.712	0.16
Learning & memory					
Rey Auditory Verbal Learning Test (RAVLT) learning trials	45.32±9.41	55.10±6.92	4.435	<0.001	1.41
RAVLT immediate recall	9.60±2.63	12.17±2.98	3.350	0.001	0.86
RAVLT delayed recall	8.68±3.02	11.67±2.81	3.793	<0.001	1.06
Brief Visual Memory Test (BVMT)-R learning trials	21.65±6.33	24.33±6.41	1.518	0.135	0.42
BVMT-R delayed recall	9.09±2.64	10.47±1.93	2.199	0.032	0.72
Psychomotor dexterity					
Grooved Pegboard Test: dominant	67.44±11.27	64.80±11.60	0.851	0.398	0.23
Grooved Pegboard Test: non-dominant	72.40±12.37	71.93±14.60	0.126	0.900	0.03
Executive functions					
Color Trail Test 1 RT (sec)	41.83±24.43	36.52±16.13	1.355	0.181	0.33
Color Trail Test 2 RT (sec)	78.07±23.80	76.52±31.90	0.201	0.841	0.05
Fuld Verbal Fluency Test (FVFT) fruits and vegetables	19.35±5.67	23.4±4.46	2.909	0.005	0.91
FVFT animals	17.74±3.80	21.87±5.88	2.925	0.005	0.70
Stroop Color RT (sec)	14.24±3.36	11.91±2.26	3.065	0.003	1.03
Stroop Word RT (sec)	18.44±5.93	14.69±3.21	2.980	0.004	1.17
Stroop Color-word RT (sec)	29.85±10.11	25.43±7.83	1.826	0.074	0.56
Wisconsin Card Sorting Test (WCST) categories	5.16±1.83	5.50±1.23	0.919	0.362	0.28
WCST perseverative errors	13.92±12.54	11.93±11.29	0.618	0.539	0.18
Mazes (Wechsler Intelligence Scale for Children III)	24.60±3.24	26.23±5.12	1.381	0.173	0.32

with those in western samples,[22] and highlight the widespread psychological impact of OSA on patients without treatment.

It is important to understand both the night-time and daytime function of patients with OSA in order to make treatment decisions, optimise outcomes, and provide more precise information to health care providers, patients, and families regarding long-term prognosis of OSA.

Acknowledgement

TABLE 3. Psychosocial outcomes of the obstructive sleep apnoea (OSA) and healthy control groups

Variable	Mean±SD		t(df=53)	P value	Effect size (d)
	OSA group (n=25)	Controls (n=30)			
Depression Anxiety Stress Scale					
Depression	7.76±8.73	2.4±3.27	3.115	0.003	1.64
Anxiety	8.2±7.31	3.13±3.39	3.389	0.001	1.50
Stress	11.76±9.09	5.97±5.53	2.907	0.005	1.05
Profile of Mood States					
Total score	1.49±1.19	0.94±0.57	2.235	0.030	0.96
Tension-anxiety	1.14±0.84	0.67±0.72	2.230	0.030	0.65
Depression-dejection	1.02±1.11	0.55±0.62	1.983	0.053	0.76
Anger-hostility	1.26±1.02	0.67±0.77	2.452	0.018	0.77
Vigor-activity	2.19±2.95	2.15±0.93	0.068	0.946	0.04
Fatigue-inertia	1.96±1.25	0.96±0.80	3.594	0.001	1.25
Confusion-bewilderment	1.36±1.05	0.65±0.64	3.086	0.003	1.11
Functional Outcomes of Sleep Questionnaire					
Total score	15.07±2.50	18.60±1.64	6.118	<0.001	2.15
General productivity	3.15±0.57	3.83±0.24	5.444	<0.001	2.83
Social outcome	3.14±0.83	3.86±0.32	3.867	0.001	2.25
Activity level	2.96±0.47	3.70±0.32	6.968	<0.001	2.31
Vigilance	2.86±0.59	3.68±0.45	5.770	<0.001	1.82
Intimate relationships	3.02±0.85	3.69±0.43	3.282	0.003	1.56
Calgary Sleep Apnea Quality of Life Index					
Total score	4.63±1.18	6.10±0.61	5.644	<0.001	2.41
Daily functioning	4.94±1.27	6.05±0.78	3.796	0.001	1.42
Social interaction	5.03±1.47	6.11±0.77	3.303	0.002	1.40
Emotional functioning	5.19±1.17	6.12±0.64	3.581	0.001	1.45
Health-related symptoms	3.35±1.74	6.14±0.92	7.210	<0.001	3.03

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Decision aids for breast cancer surgery: a randomised controlled trial

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KEY MESSAGE

In Chinese women who require breast cancer surgery, use of a decision aid booklet reduces decisional conflict, treatment decision-making difficulty, and post-surgery decision regret. Decision aids should be available as part of the routine clinical service, specifically to support post-consultation decision making.

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Introduction

Breast cancer management involves medical, surgical, and radiotherapeutic treatments. Our previous study showed that approximately one in seven of the ~2500 Chinese women diagnosed with breast cancer each year suffer from increased psychological morbidity attributable to treatment decision-making (TDM) difficulty.[1,2] Two-thirds of the women preferred shared rather than sole responsibility for TDM, with guidance received from doctors.[3] However, most women were left to decide on treatment alone, and many opted to have more extensive surgery than necessary, owing to a fear of prolonged treatment and associated social stigmatisation.[3] The social and relationship consequences of this choice are often poorly comprehended before treatment and thus compound subsequent psychosocial morbidity. Information and decision-support strategies are needed to optimise women's breast cancer TDM.

Decision aids facilitate decision making by emphasising alternatives, probability of risks and benefits, and personal values.[4] In a systematic review of the effect of decision aids in women with breast cancer, those who used a decision aid were more likely to choose breast-conserving therapy, were more knowledgeable about breast cancer, and had less decisional conflict and were more satisfied with the decision-making process.[5] Nonetheless, there is no evidence that decision aids directly benefit health outcomes such as psychological morbidity. Their benefit may be mediated by patient satisfaction with the decision process.

This study assessed the effect of decision aids on the decision-making process, satisfaction with TDM, and psychological morbidity in women undergoing breast cancer surgery.

Methods

This randomised controlled trial was conducted from December 2009 to November 2011 at Kwong Wah Hospital Breast Centre and Tung Wah Hospital Breast Centre. Ethical approval was obtained. Cantonese/Mandarin-speaking Chinese women with early-stage breast cancer who had no other cancer history, were fit for surgery, and consented to be interviewed were invited to participate. Patients were excluded if they were to receive chemotherapy as a neo-adjuvant therapy, came for a second opinion, had metastasis or recurrence of breast cancer, or were cognitively impaired or physically unfit to complete the interview.

Women were block randomised by week to either an intervention (decision aid booklet) or control (standard-information booklet) arm. Procedures and wordings were identical. The corresponding booklet was provided prior to making a decision by telephone about treatment. The decision aid booklet comprised information about (1) the main differences between the available treatment options and their associated probable outcome, (2) benefits and costs of the available treatments, (3) methods for clarifying patients' values, and (4) structured guidance in reaching a decision. The standard-information booklet contained information on diagnosis, treatment, and management of breast cancer in general terms and was not designed to help make a specific, personal treatment decision.

Women were asked to complete questionnaires immediately (baseline: time 1) and within 7 days (time 2) of consultation, and at 4 weeks (time 3), 4 months (time 4), and 10 months (time 5) post-surgery. Face-to-face interviews were conducted at

baseline and follow-up assessments.

Outcome measures included satisfaction with the decision process (scores of TDM difficulty and decisional conflict), psychological morbidity (scores of Chinese Health Questionnaire and Hospital Anxiety and Depression Scale [HADS]), satisfaction with the treatment decision (scores of decision regret), and knowledge of breast cancer.

The two groups were compared using linear mixed effects (LME) models to control the random effects of hospital sites and surgeons. Covariates correlated with outcome measures were also included in the models to adjust for confounders. Intention-to-treat analysis was also used. For repeated measures (decision regret, psychological distress, and realistic outcome expectation), mean differences within and between groups were analysed using LME models, with random subject effects estimated for the intercept, slope for time, time-squared, and time-cubed. The quadratic and cubic effects of time were included to account for non-linear change over time. The LEM model was adjusted for relevant demographic and clinical variables, and decision-making factors. To assess whether the booklet significantly influenced psychological morbidity, the mediating effect of patient satisfaction with TDM and use of the booklet on psychological morbidity was tested.

Results

A total of 276 women were randomised to the intervention (n=138) or control (n=138) group (Fig 1); 225 (81.5%) women (113 in intervention and 112 in control groups) were offered more than one treatment option (Table 1). Compared with controls, decision aids were associated with lower scores for TDM difficulty ($\beta=1.8$, P=0.016), decisional conflict ($\beta=5.8$, P=0.004), and decision regret ($\beta=4.55$, P<0.05) [Table 2]. Nonetheless, the two groups did not differ significantly in terms of decision regret at 4 weeks,
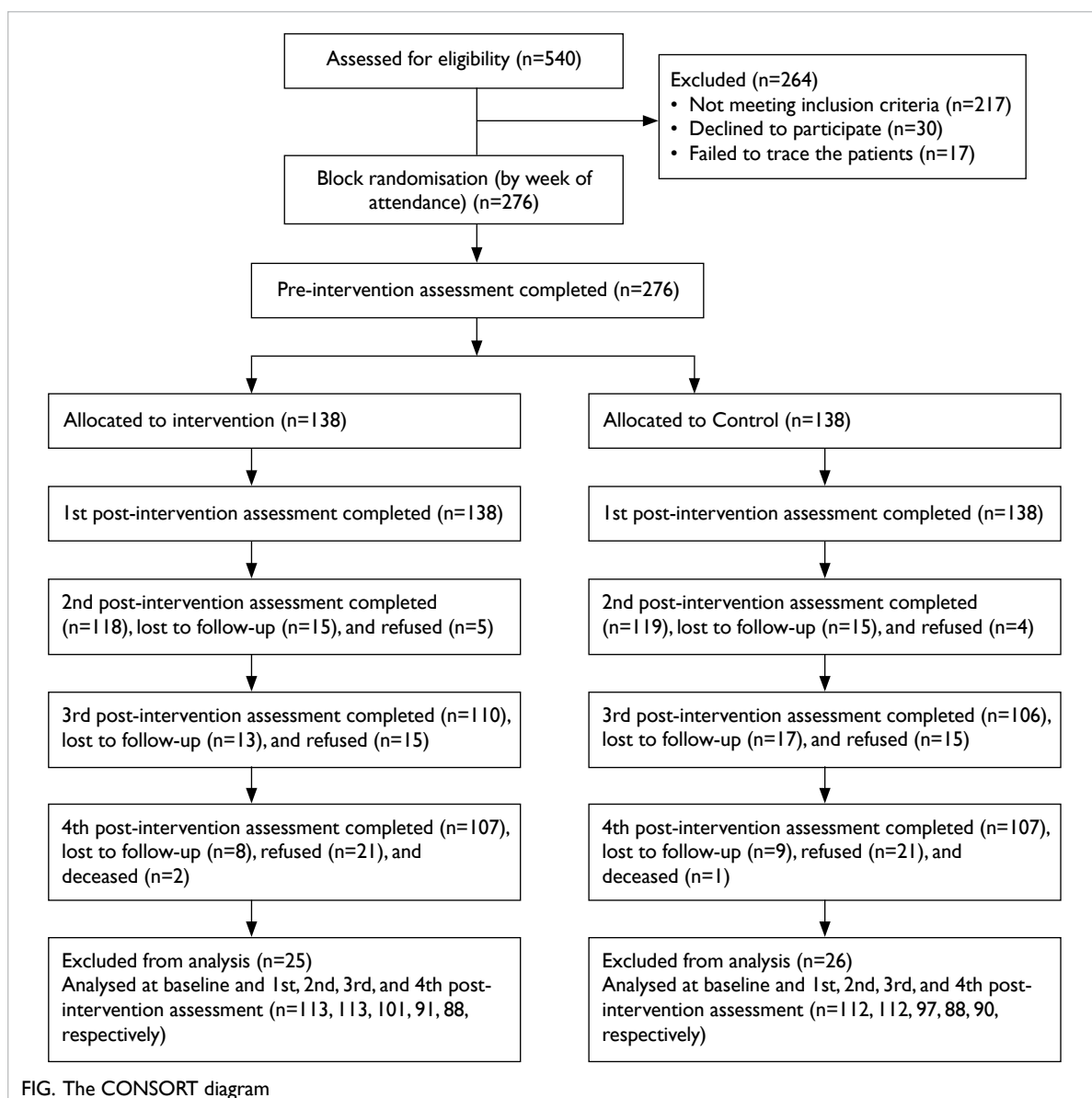

FIG. The CONSORT diagram

TABLE 1. Patient demographics*

Variable	Decision aids (n=138)	Controls (n=138)	P value
Age (years)	56.8±10.8	54.6±10.1	>0.05
Marital status			>0.05
Married	85 (61.6)	87 (63)	
Single	21 (15.2)	19 (13.8)	
Divorced	12 (8.7)	12 (8.7)	
Widowed	20 (14.5)	20 (14.5)	
Education level			>0.05
No formal education	8 (5.8)	11 (8.0)	
Primary	44 (31.9)	40 (29.0)	
Secondary	71 (51.4)	73 (52.9)	
Tertiary	15 (10.9)	14 (10.1)	
Occupation			>0.05
Employed	51 (36.9)	63 (45.6)	
Retired	37 (26.8)	27 (19.6)	
Housewife	40 (29)	30 (21.7)	
Unemployed	10 (7.25)	18 (13.0)	
Monthly household income (HK$)			>0.05
≤10 000	55 (42)	56 (43.8)	
10 001-20 000	43 (32.8)	36 (28.1)	
20 001-30 000	18 (13.7)	20 (15.6)	
30 001-40 000	8 (6.1)	9 (7.0)	
>40 000	7 (5.3)	7 (5.5)	
Family history of breast cancer	14 (10.1)	13 (9.4)	>0.05
More than one treatment choice	113 (83.7)	112 (83.0)	>0.05
Stage of breast cancer			>0.05
0	31 (37.8)	21 (28.8)	
I/II	42 (51.3)	47 64.4)	
III	9 (11)	5 (6.8)	
Active chemotherapy			
At 1 month	21 (18.1)	19 (22)	>0.05
At 4 months	29 (28.2)	26 (25)	>0.05
At 10 months	0 (0)	0 (0)	>0.05
Active radiotherapy			
At 1 month	9 (8.6)	5 (4.8)	>0.05
At 4 months	9 (8.6)	4 (4.8)	>0.05
At 10 months	2 (2)	1 (1)	>0.05
Active hormonal therapy			
At 4 months	31 (30.1)	33 (31.7)	>0.05
At 10 months	65 (63.7)	64 (62.7)	>0.05

* Data are presented as mean±SD or No. (%) of patients

realistic outcome expectation, knowledge of breast cancer, or scores of Chinese Health Questionnaire, HADS-Anxiety and HADS-Depression.

Discussion

Decision aids decreased TDM difficulty, decisional conflict, and decision regret, without increasing anxiety. Decision aids could be an adjunct to post-consultation support in TDM. The effect of decision aids on psychological morbidity was not mediated by patient satisfaction with the decision process. Psychological distress was associated with TDM difficulty, decision regret, and lack of treatment recommendation from the surgeon. Decision aids minimised TDM difficulty. This highlights the importance of reducing the level of TDM difficulty for women considering breast cancer surgery. Future study is needed to identify the optimal strategy

TABLE 2. Comparison of outcomes

Variable	Decision aid (n=113) Mean±SD	Controls (n=112) Mean±SD	Adjusted β±SE (95% CI) [decision aid as reference]	P value (95% CI)
Treatment decision-making difficulty	17.5±6.3	19.1±6.4	1.8±0.7 (0.34-3.24)	0.016 (0.34-3.24)
Decisional conflict	15.8±15.5	19.9±16.3	5.8±1.9 (1.85-9.71)	0.004 (1.85-9.71)
Knowledge of breast cancer	6.1±2.1	5.9±2.1	-0.17±0.2 (-0.65-0.31)	>0.05 (-0.65-0.31)
Chinese Health Questionnaire				
4 weeks	7.8±4.8	8.3±5.8	0.5±0.6 (-0.71-1.70)	>0.05 (-0.71-1.70)
4 months	7.6±5.3	7.3±5.6	0.21±0.69 (-1.17-1.57)	>0.05
10 months	6.7±4.9	7.5±5.6	1.4±0.7 (-0.07-2.86)	>0.05
Hospital Anxiety and Depression Scale (HADS)-Anxiety				
4 weeks	2.5±3.2	2,6±3.3	-0.1±0.4 (-0.94-0.67)	>0.05 (-0.94-0.67)
4 months	2.2±3.2	2.1±3.1	-0.08±0.38 (-0.85-0.68)	>0.05
10 months	2.7±3.5	2.8±3.6	0.28±0.47 (-0.65-1.22)	>0.05
HADS-Depression				
4 weeks	2.3±2.7	2.3±2.7	0.1±0.3 (-0.58-0.61)	>0.05 (-0.58-0.61)
4 months	2.1±3.3	1.9±2.4	0.07±0.32 (-0.56-0.71)	>0.05
10 months	1.4±1.9	2.5±3.4	1.38±0.41 (0.58-2.19)	0.001
Decision regret				
4 weeks	21.4±17.2	23.1±18.3	1.6±2.4 (-3.19-6.47)	>0.05 (-3.19-6.47)
4 months	18.8±15.8	24.4±18.9	5.9±2.5 (0.95-10.84)	0.02
10 months	20.1±14.5	24.6±18.8	6.1±2.4 (1.28-10.94)	0.014
Realistic outcome expectation				
4 weeks	-0.01±0.64	-0.11±0.56	-0.04±0.08 (-0.20-0.11)	>0.05 (-0.20-0.11)
4 months	-0.19±0.64	-0.20±0.56	0.05±0.09 (-0.13-0.24)	>0.05 (-0.13-0.24)
10 months	-0.28±0.56	-0.22±0.57	0.15±0.09 (-0.21-0.33)	>0.05
Surgical decision				
No. (%) of patients having breast-conserving therapy (BCT) as an option	Out of 73	Out of 86		>0.05
BCT	29 (43)	41 (51)		
Modified radical mastectomy (MRM)	31 (46)	32 (39)		
MRM plus reconstruction	7 (10)	7 (10)		
No. (%) of patients not having BCT as an option	Out of 40	Out of 26		>0.05
BCT	3 (7.9)	1 (4.3)		
MRM	30 (78.9)	14 (60.9)		
MRM plus reconstruction	5 (13.2)	8 (34.8)		

to integrate decision aids into routine clinical practice.

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Delirium and cognitive decline after surgery: a randomised controlled trial of anaesthetic management to improve postoperative mental health outcome

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KEY MESSAGE

For every 23 elderly (aged ≥65 years) patients undergoing major colorectal surgery, anaesthetic delivery titrated according to the bispectral electroencephalographic index prevents an episode of postoperative mental disturbance.

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Previous clinical trials and animal experiments have suggested that long-lasting exposure to general anaesthetics may lead to postoperative mental disturbance. Intraoperative monitoring of processed electroencephalogram (EEG), such as the bispectral index (BIS), has been shown to facilitate titration of anaesthetic drug delivery.[1,2] The BIS monitor analyses raw EEG signals and displays a dimensionless number, ranging from 0 (isoelectric EEG) to 100 (fully awake), to indicate the depth of anaesthesia. By aiming at a BIS value between 40 and 60 during anaesthesia, the doses of hypnotic agents administered can be reduced by 11% to 27%.[3,4] However, it is unclear whether a lower dose of anaesthetics with BIS monitoring will minimise anaesthetic side effects, leading to an improvement of cognitive function after surgery. We have recently published study to evaluate the impact of BIS-guided anaesthesia on postoperative mental health in elderly patients undergoing major surgery.[5]

The Cognitive Dysfunction after Anesthesia (CODA) Trial recruited 921 patients aged ≥65 years having general anaesthesia for major colorectal surgery. Patients were randomised to receive either BIS-guided anaesthesia (n=462) or routine care (n=459), in which anaesthetic drug administration was titrated according to clinical judgement. All patients were interviewed before surgery and at 30 days and 3 months after surgery for objective neuropsychology assessments. A cognitive failure questionnaire was used to measure subjective change in perception, memory, and motor function. Patients were monitored daily after surgery until discharge to detect complications and occurrence of delirium using the Confusion Assessment Method criteria.

Anaesthesia guided by BIS reduced anaesthetic drug dosage as indicated by a reduced volatile anaesthetic concentration by 29.7% (95% confidence intervals [CI], 25.9-32.8, P<0.001) and estimated propofol effect site concentration by 20.7% (95% CI, 12.1-31.9, P<0.001). The mean±standard deviation BIS value during surgery was higher in the BIS-guided group than in the routine care group (53.2±8.9 vs 38.6±6.5, P<0.001). The amount of time when BIS <40 was also lower in the former than latter (7.2±7.8 vs 22.8±7.3 minutes, P<0.001).

Compared with routine care, BIS-guided anaesthesia decreased the risk of postoperative cognitive decline (14.7% vs 10.2%, P=0.02, Fig), and the number needed to treat was 23 (95% CI, 6-391). The benefit of BIS monitoring was unchanged after adjusting for age, gender, education status, average BIS value during anaesthesia, and postoperative delirium while in hospital (adjusted odds ratio, 0.67; 95% CI, 0.32-0.98; P=0.025). Compared with routine care, BIS-guided anaesthesia decreased the rate of postoperative delirium (24.1% vs 15.6%, P=0.001, Fig). Thus, BIS-guided anaesthesia decreased the risk of postoperative delirium during initial hospitalisation by 35% and cognitive decline at 3 months after surgery by 31%. The CODA Trial highlighted the potential harmful effects of deep anaesthesia, commonly defined as BIS of <40.[6] However, a randomised controlled trial comparing two distinct levels of anaesthetic depth is needed to establish the causal relationship. In collaboration with the Australian and New Zealand College of Anaesthetists Trials Group, we have initiated the Balanced Trial (Australian New Zealand Clinical Trials Registry No: ACTRN12612000632897) to determine the impact of light versus deep general anaesthesia on postoperative adverse outcomes (including delirium and other mental disturbance), in 6500 moderate to high risk patients having major

non-cardiac surgery.[7]

In conclusion, the CODA Trial indicated that for every 1000 patients undergoing major surgery, BIS-guided anaesthesia prevented 83 patients from suffering delirium during hospital admission and 23 patients from postoperative cognitive decline at 3 months after surgery. Given that intra-operative low BIS values, a long period of deep anaesthesia (BIS <40), and large doses of anaesthetic were predictors of postoperative cognitive dysfunction, BIS monitoring with careful titration of anaesthetics should prevent unintentional deep anaesthesia and may be useful for improving postoperative cognitive performance in the elderly.

Acknowledgement

FIG. Postoperative cognitive dysfunction and delirium in patients receiving bispectral index (BIS)–guided anaesthesia or routine care

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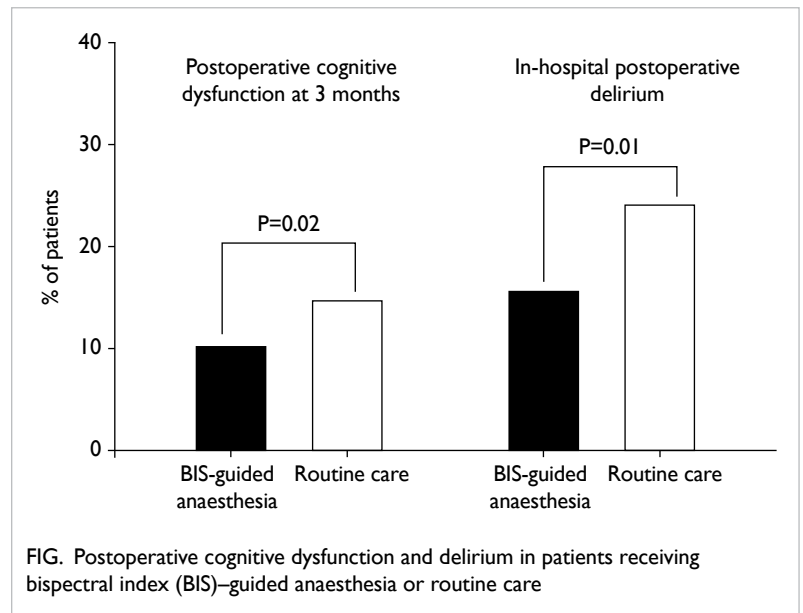
Validity and reliability of a Two-Minute Assessment rapid dietary questionnaire measuring healthy eating behaviours among Hong Kong primary school students

GS Guldan *, TS Lau, HM Lee

KEY MESSAGES

1. The Two-Minute Assessment (TMA) had good reliability and validity in assessing primary school students' dietary intakes, such as calcium, dietary fibre, carbonated drinks, milk or soy milk, fruits, and vegetables.

2. The TMA can be self-administered and reviewed quickly, and therefore can be used to detect imbalanced diets and unhealthy lifestyles among Hong Kong primary school students for counselling and group-level healthy eating behaviour measurement.

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Introduction

Poor dietary intake is one of the causes of obesity. Children nowadays consume more energy-dense foods, foods away from home, commercially prepared or processed foods, but less fruits and vegetables, and often skip breakfast.[1,2] To correct dietary imbalances, dietary assessment is needed to design effective interventions. However, common dietary assessment methods, such as food records and 24-hour dietary recall, are not feasible in schools, communities, and most clinical settings, owing to their time-consuming, labour-intensive, and expensive nature. Therefore, a rapid, reliable, and valid assessment tool should be developed. This study aimed to test the reliability and validity of a Two-Minute Assessment (TMA) among Hong Kong primary school students.

Methods

This study was conducted from September 2008 to July 2009 to examine the reliability and validity of a rapid dietary assessment tool—the TMA—in assessing eating behaviours and dietary intake of 391 primary five (P5) and six (P6) students (54.0% boys; 51.7% P5) from four schools. Students' dietary intake data were analysed using Nutrition Data System for Research software version 2007, and students' average daily nutrient and food group intakes were obtained.

The reliability of the draft TMA was assessed among 1301 P5 and P6 students (mean±standard deviation [SD] age, 11.6±0.7 years) [54.1% boys; 48.7% P5] who completed both first and second TMAs over a 2-week test-retest period using Kappa statistics and percent agreement, with 75% as the cut-off indicating agreement. The validity of the draft TMA was assessed for the 357 students (mean±SD age, 11.5±0.6 years) [54.6% boys; 51.5% P5] who completed both first and second TMAs and the 24-hour dietary recalls. The validity of the rapid assessment tool binary diet behavioural items at the first TMA administration was assessed relative to the quantitative food and nutrient intakes revealed in the 3 days of 24-hour dietary recall interviews to find if specific dietary behaviours were correlated with the food and/or nutrient intakes and behaviours reported from the 24-hour dietary recall interviews.

Results

The percent agreement of the TMA eating behaviour questions ranged from 72.9% to 90.8% (Table 1). The percent agreement exceeded 75% for 16 out of the 17 questions. The question regarding the consumption of sugar-added non-carbonated drinks had a percent agreement of 72.9%. Test-retest Kappa values of the 17 questions were fair to substantial based on the Landis and Koch scale, with 88% of the questions having Kappa values of >0.41, which is defined as moderately reliable.

Eating behaviour questions regarding the consumption of daily breakfast, candies or chocolates, carbonated drinks, milk or soy milk, fruits and vegetables, deep fried foods, white or whole wheat bread, and meats with visible fat or poultry with skin

TABLE 1. Reliability of the Two-Minute Assessment questions

Question	% Agreement	Kappa value (95% CI)
Daily eating pattern		
I have breakfast every day	90.81	0.750 (0.707-0.793)
I have more than three meals and two snacks per day	76.55	0.449 (0.395-0.503)
I eat the following foods daily, or almost as often:		
>2 cookies	84.00	0.427 (0.355-0.499)
Sweet cakes or crème cakes	89.02	0.274 (0.160-0.387)
Instant noodles	83.48	0.496 (0.433-0.558)
Candies, chocolates	77.21	0.500 (0.449-0.550)
Potato or other crisps	82.37	0.463 (0.399-0.526)
Carbonated drinks (cola, etc.)	80.02	0.483 (0.426-0.539)
Sugar-added non-carbonated drinks (lemon tea, milk tea, soy milk, etc)	72.94	0.493 (0.389-0.590)
I drink >1 glass of fruit juice per day	77.49	0.366 (0.302-0.431)
I drink 1 glass of milk or soy milk per day	78.33	0.567 (0.522-0.612)
I eat ≥2 fruits every day (apple/orange size)	78.74	0.552 (0.505-0.599)
I eat ≥2 rice bowls of vegetables every day	76.73	0.534 (0.488-0.580)
Weekly eating/lifestyle pattern		
I eat deep fried food (French fries, fried chicken, spring rolls, etc) more than twice per week	76.91	0.412 (0.352-0.471)
I eat fast food from a restaurant more than twice per week	84.12	0.463 (0.366-0.507)
I eat only white bread, and never eat whole wheat bread	75.90	0.460 (0.407-0.512)
I eat meats with visible fat, or poultry with skin more than three times a week	86.14	0.472 (0.401-0.544)

showed expected associations with the students' dietary behaviours and also their dietary intakes of specific food items and selected nutrients (Table 2). However, four TMA items concerning students' daily consumption of cookies, sweet or crème cakes, potato or other crisps, and fruit juice were invalid in assessing students' intakes of any nutrient, food group, or specific food item intakes. Some gender differences but not grade differences were noted in the validity of the TMA.

Discussion

Both the prevalence of a particular behaviour and question wording may affect the reliability estimates of the TMA. For example, the prevalence of consumption of instant noodles and sugar-added non-carbonated drinks from the 24-hour dietary recalls suggested that more students never or seldom eat instant noodles (prevalence of consumption, 41.7%), compared to their more frequent consumption of sugar-added non-carbonated drinks (prevalence of consumption, 77.3%). Therefore, these students were more likely to recall their instant noodle consumption than they were for sugar-added non-carbonated drinks, and higher reliability was obtained for instant noodle consumption than for sugar-added non-carbonated drinks. This finding is in keeping with that in another study.[3]

The wording of the questions may also affect reliability estimates. For example, even though the TMA questionnaire was pre-tested and examples were given during administration, the terms 'sugar-added non-carbonated drinks', 'sweet or crème cakes', and 'fruit juice' might still have been ambiguous or cognitively less clear to some students. For example, sugar-added non-carbonated drinks cover a wide variety of drinks (such as teas, fruit drinks, and soy milk) yet exclude carbonated beverages. Students might have had different understandings of the term at the two administrations, and might have had difficulty in categorising these two food items. This may explain the relatively low (72.9%) percent agreement obtained.

The overall TMA validity was good for both genders. However, gender differences were noted, as boys and girls differed in some dietary practices. No validity difference was observed between students in different grades, suggesting that the TMA validity was similar for both groups of students.

The questions with foods that were clearly defined and eaten more frequently, such as vegetables, milk or soy milk, showed better validity than others that were less clearly understood and/or eaten less frequently. Specific actionable feedback can be given for those less healthy behaviours. However, four dietary behavioural questions regarding students'

TABLE 2. Associations between each question and students' dietary behaviours and intakes

Question	Association between each question and students' dietary behaviours and intakes
Has daily breakfast	1. Students who reported this behaviour had daily breakfast habit in 24-hour dietary recalls (86.4% vs 13.6%, P<0.001) 2. Students who reported this behaviour met the minimum grain and cereal (31.8% vs 18.3%, P=0.028) and vegetable (47.9% vs 33.8%, P=0.034) intake recommendations 3. Students who reported this behaviour exceeded the maximum cholesterol (41.6% vs 26.8%, P=0.029) and meat and meat alternative (58.4% vs 38.0%, P=0.002) intake limits 4. Boys who reported this behaviour had higher intakes of energy, total fat, saturated fatty acids (SFA), carbohydrates, protein, cholesterol, dietary fibre, vitamin D, calcium, iron, grains and cereals, fruits and vegetables (data not shown) 5. Boys who reported this behaviour had higher intakes of sodium and meat and meat alternatives (data not shown) 6. Girls who reported this behaviour had higher intake of grains and cereals (data not shown)
Has >3 meals and 2 snacks daily	Boys who reported this behaviour (n=63, 32.3%) had lower daily vegetable intakes (3.28±1.96 taels vs 4.12±2.47 taels, P=0.019)
Eats >2 cookies daily	No association found
Eats sweet/crème cakes daily	No association found
Eats instant noodles daily	1. 19.0% of students who reported this behaviour were less likely to exceed the cholesterol intake limit (27.9% vs 41.6%, P=0.039) 2. Students who reported this behaviour were also less likely to meet the minimum dietary fibre intake recommendations (4.4% vs 16.8%, P=0.007), and minimum vegetable intake recommendations (36.7% vs 50.9%, P=0.009) 3. Boys who reported this behaviour consumed less fat, cholesterol, sodium, carbohydrates, protein, dietary fibre, grains and cereals, and vegetables (data not shown)
Eats candies/chocolates daily	Girls who reported this behaviour (n=60, 37.0%) consumed more candies or chocolates (4.12±9.27 g vs 1.58±4.37 g, P=0.050)
Eats potato/other crisps daily	No association found
Drinks carbonated drinks daily	1. Students who reported this behaviour consumed more carbonated drinks (boys: 100.40±122.36 ml vs 45.83±80.95 ml, P=0.006; girls: 88.97±103.52 ml vs 46.97±92.42 ml, P=0.011) 2. Students who reported this behaviour were less likely to meet the recommendations for dietary fibre (6.9% vs 16.5%, P=0.040), fruits (37.5% vs 51.3%, P=0.047), and vegetables (34.7% vs 48.4%, P=0.046)
Drinks sugar-added non-carbonated drinks daily	Students who reported this behaviour failed to meet the recommendations for dietary fibre (10.7% vs 20.7%, P=0.013) and vegetable (40.0% vs 53.6%, P=0.016) intake
Drinks >1 glass of fruit juice daily	No association found
Drinks 1 glass of milk/soy milk daily	1. Students who reported this behaviour consumed more milk (boys: 106.87±110.66 ml vs 48.45±69.52 ml, P<0.001, girls: 102.19±103.11 ml vs 63.32±88.37 ml, P=0.012) and soy milk (boys: 50.75±87.40 ml vs 31.91±59.00 ml, P=0.076; girls: 60.40±113.34 ml vs 17.70±47.05 ml, P=0.002) 2. Students who reported this behaviour had higher absolute calcium intakes (boys: 536.36±205.75 mg vs 469.65±208.74 mg, P=0.026; girls: 538.29±197.72 mg vs 465.46±184.90 mg, P=0.018) 3. Students who reported this behaviour were more likely to have >30% of calories from fat (45.9% vs 35.0%, P=0.040) and >10% of calories from SFA (28.4% vs 15.3%, P=0.003)
Eats 2 or more servings of fruits daily	1. Students who reported this behaviour were more likely to meet the recommendations for fruit (59.5% vs 30.7%, P<0.001) and vegetable (53.6% vs 31.4%, P<0.001) intake, and to have higher dietary fibre and fruit intakes (data not shown) 2. Students who reported this behaviour were less likely to exceed the recommendations for energy from SFA (18.2% vs 29.2%, P=0.019), trans fat (62.3% vs 74.5%, P=0.021), and fat (36.8% vs 47.4%, P=0.060)
Eats 2 or more rice bowls of vegetables daily	Students who reported this behaviour met the vegetable intake recommendation (54.4% vs 34.5%, P<0.001)
Eats deep fried food >2x/week	1. Students who reported this behaviour showed trends to be more likely to exceed the maximum energy recommendations from fat (49.4% vs 38.1%, P=0.076) and trans fat (75.3% vs 64.2%, P=0.064) 2. Students who reported this behaviour were less likely to meet the vegetable intake recommendations (31.8% vs 49.4%, P=0.006) 3. Boys who reported this behaviour consumed more deep fried foods (25.31±38.62 g vs 12.26±29.71 g, P=0.027)
Eats fast food >2x/week	1. Students who reported this behaviour had ≤300 mg cholesterol intake (22.0% vs 41.9%, P=0.005) 2. Students who reported this behaviour failed to meet minimum vegetable intake recommendations (25.4% vs 49.0%, P=0.001)
Eats only white bread, not whole wheat bread	Boys who reported this behaviour consumed less whole wheat bread (0.51±3.92 g vs 5.02±18.09 g, P=0.006)
Eats meats with visible fat or skin >3x/week	Boys who reported this behaviour consumed more poultry (1.38±1.16 taels vs 1.04±0.86 taels, P=0.035)

consumption of cookies, sweet or crème cakes, potato or other crisps, and fruit juice were not valid in assessing any nutrient, food group, or specific food item intakes. This might have been due to the low prevalence of consumption of these foods, or the small amounts consumed by these students. The prevalence of consumption of these four food items were low, perhaps because of the nutrition policies of the four schools to limit the selling of these unhealthier snacks in their 'tuck shops' and vending machines. The validity of these four questions may have been lower because students may have given more socially desirable responses during the 24-hour dietary recall interviews with parents present, as the students probably recognised that these foods were among the less healthy snacks.

Conclusions

The TMA showed good reliability and validity in assessing students' dietary behaviour and intake. It can be self-administered and reviewed quickly, and therefore can be used to detect imbalanced diets among Hong Kong primary school students for group-level healthy eating behaviour measurement and intervention.

Acknowledgement

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Professional breastfeeding support to increase the exclusivity and duration of breastfeeding: a randomised controlled trial

M Tarrant *, DYT Fong, M Heys, ILY Lee, A Sham, EWH Hui Choi

KEY MESSAGE

Modest postnatal support interventions such as providing early support with breastfeeding and conducting brief weekly telephone support can improve both the duration and exclusivity of breastfeeding.

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The benefits of breastfeeding are dose-dependent; infants attain better health outcomes with a longer duration of exclusive breastfeeding.[1,2] The World Health Organization recommends that infants be exclusively breastfed for 6 months with continued breastfeeding for up to 2 years of age and beyond.[3] Although breastfeeding initiation rates are high in most developed countries, the proportion of infants exclusively breastfed decreases substantially in the first 3 months.[4] In Hong Kong, >80% of women initiate breastfeeding,[5] but only 30% continue to breastfeed exclusively for 3 months.[6] Inadequate in-hospital and community support are contributing factors to early breastfeeding cessation. Thus, early breastfeeding support and guidance are important to prevent early cessation. This study aimed to assess the effect of early postpartum professional breastfeeding support on the duration of any and exclusive breastfeeding among primiparous women.

In Hong Kong, 724 postnatal women admitted to postnatal obstetric units of three public hospitals between November 2010 and September 2011 were randomised to usual care (n=264), in-hospital support (n=191), or telephone support (n=269). Participants were followed up for 6 months or until their babies completely weaned from breastfeeding, whichever came first.

Compared with the usual care group, the in-hospital support group and telephone support group were more likely to breastfeed (any and exclusive) at all four time points.[7] Compared with the usual care group, the in-hospital support group was more likely to breastfeed (any) at all four time points, but the overall effect of the intervention was not significant. Participants who received the telephone support were significantly more likely to breastfeed (any) at 1 month and 2 months postpartum and to exclusively breastfeed at 1 month postpartum. Compared with in-hospital support, telephone support was more effective overall, but not significantly so.

These findings suggest that postnatal telephone support can significantly improve the duration of any and exclusive breastfeeding among Hong Kong postpartum mothers. Many breastfeeding problems do not present until after hospital discharge and thus support after discharge may be more beneficial in helping mothers to resolve problems. The benefits of breastfeeding are dose-dependent, with longer duration of exclusive breastfeeding conferring greater benefits. The challenge is to encourage public hospitals to provide both in-hospital and after-discharge breastfeeding support to enhance and sustain breastfeeding.

Acknowledgement

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Effect of therapeutic play on pre- and post-operative anxiety and emotional responses in Hong Kong Chinese children: a randomised controlled trial

WHC Li *, SSC Chan, EML Wong, MC Kwok, ITL Lee

KEY MESSAGES

1. Play is a very important part of children's lives even when they are ill. Awareness of the importance of play in nurses, parents, and health care professionals should be promoted.

2. There is empirical evidence of the effectiveness of therapeutic play intervention in preparing children for surgery.

3. The transferability, feasibility, and cost-effectiveness of therapeutic play intervention in Hong Kong clinical settings are supported.

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Introduction

Surgery, in particular the preparation procedure for anaesthesia, can be very stressful for children and has a profound effect.[1,2] Excessive anxiety and stress can affect children's physical and mental well-being, hinder their ability to cope with surgery, and inhibit their postoperative recovery. Psychological needs of children are seldom taken into consideration. In a study of paediatric day surgery in Hong Kong Chinese children, the preoperative anxiety level of the children was high, despite having received information on pre- and post-operative care.[1]

Therapeutic play intervention in preparing children for hospitalisation and medical procedures has increased. Nevertheless, studies to assess the implementation potential of therapeutic play intervention, including the transferability, feasibility, and cost-effectiveness, in preparing children for surgery in Hong Kong clinical settings are lacking. This study aimed to examine the effectiveness of therapeutic play intervention in preparing children undergoing elective surgery and assess the implementation potential of such intervention in Hong Kong clinical settings.

Methods

The study was approved by the hospital ethics committee and conducted from November 2009 to November 2011. Written consent was obtained from the parents. A total of 108 children admitted for elective surgery who were aged 7 to 12 years, able to speak Cantonese and read Chinese, and accompanied by their parents (either mother or father) on the preoperative assessment day and day of surgery were randomised to the experimental (n=51) or control (n=57) groups. However, five children in the experimental group failed to attend the intervention and four children were lost to follow-up. Children who had undergone surgery previously, or had identified cognitive and learning problems were excluded.

Children in the control group received routine preoperative information preparation, including preoperative fasting time, physical health care and preparation, personal hygiene, postoperative wound care, possible postoperative complications and their management, and methods of controlling postoperative pain. Children in the experimental group received usual care plus therapeutic play intervention, which was implemented in a small group with a maximum of 5 children. The intervention was standardised and lasted for 1 hour (Table 1).

The anxiety level of all children and parents was assessed using the Chinese version of the State Anxiety Scale for Children and Adults at three time points: preoperation (before intervention), preoperation (after intervention), and postoperation. Children's emotional responses during the procedure of anaesthesia were documented using the Children's Emotional Manifestation Scale. Before discharge home, the Postoperative Parents' Satisfaction Questionnaire was used to measure the patient's perception of the adequacy, relevancy, and understanding of the preoperative information.

TABLE 1. Therapeutic play intervention protocol

Time	Activities
00:00	1. In the operating theatre: research nurses meet the children and their parents and explain the procedures that will be performed: identification and verifying the information, checking the bracelet, and checking the consent form. 2. The environment and equipment are introduced, including the operating table, anaesthetic and monitoring machines, and operating lamp.
00:10	1. In the operating theatre: doll demonstration on obtaining vital signs for the child: (1) apply electrocardiographic electrodes on the doll's upper chest and lower trunk, (2) place a pulse oximeter on the doll's finger, (3) attach a blood pressure cuff to the doll's arm, and (4) apply a stethoscope to the doll's chest and explain how the doctors and nurses will use it to listen to the child's heart and lungs. 2. Doll demonstration on receiving oxygen and anaesthesia gas therapy: (1) explain the purposes of the oxygen mask and anaesthesia gas, (2) apply the anaesthetic mask on the doll, and (3) give the children the mask and ask them to try it on. 3. Doll demonstration on intravenous therapy: (1) explain the purposes of setting up an infusion line, (2) show the soft catheter and demonstrate how this soft catheter will be put in to the doll's forearm, and (3) reinforce to the children that such a procedure will only be performed after they are asleep.
00:25	In the operating theatre: encourage each child to return demonstrate the procedures on the doll with supervision and guidance.
00:50	In the recovery room: tell the children that they will stay for around 30 minutes and their parents will stay with them when they regain consciousness from anaesthesia, and explain to the children that some procedures will be performed: measurement of blood pressure, pulse rate, electrocardiograph, and oxygen saturation, and receipt of oxygen therapy.
00:55	Question and answer session: clarify any misconceptions and queries, and reassure the children that they will be asleep during the whole surgical procedure and will only wake up after the surgery.
01:00	End of the therapeutic play intervention.

Additionally, a semi-structured interview was conducted for selected children, parents, and nurses working in the operating theatre.

Intention-to-treat analysis was used, with missing data substituted by the last observation carried forward method. The homogeneity of the experimental and control groups in terms of demographic, clinical, and baseline data were assessed using inferential statistics (independent t-test and chi-square test). Mixed between-within subject analysis of variance (ANOVA) was used to determine which intervention was more effective in reducing the state anxiety of children and their parents. Independent t-test was used to determine any difference in the mean scores of children's emotional responses during anaesthesia induction, and parents' satisfaction between the experimental and control groups. Additionally, content analysis was used to draw conclusions by creating categories of data from verbatim or unstructured data.

Results

The experimental and control groups were similar with respect to the age and sex of the children, parents' educational attainments, type of surgery performed, and the baseline state anxiety levels of parents and children (Table 2).

Effects of intervention on children

Mixed between-within subject ANOVA indicated a significant main effect for intervention. Children in the experimental group reported lower state anxiety scores than children in the control group (Table 3).

Using the guidelines proposed by Cohen,[3] the partial eta squared of 0.06 indicated that the effect size for the intervention was moderate. An independent t-test showed a significant difference in mean Children's Emotional Manifestation Scale scores between the two groups (t [106]=−5.03, P<0.001). Children who received the therapeutic play intervention exhibited fewer emotions at induction of anaesthesia. The partial eta squared of 0.19 indicated that the effect size for the intervention was large.

Effects of intervention on parents

Mixed between-within subject ANOVA indicated no significant difference in parents' anxiety scores between the two groups. The partial eta squared of 0.03 indicated that the effect size for the intervention was small. An independent t-test showed a significant difference in mean satisfaction score for parents in the two groups (t [106]=3.04, P=0.003). Parents of children receiving therapeutic play intervention reported more satisfaction. The partial eta squared of 0.08 indicated that the effect size for the intervention was moderate.

Process evaluation

Semi-structured interviews indicated that the therapeutic play intervention was feasible and acceptable to both health care providers and participants.

Discussion

This study demonstrated the effectiveness of therapeutic play intervention in preparing children

TABLE 2. Baseline characteristics of the experimental and control groups

Variable	No. (%) of participants		P value*
	Experimental group (n=51)	Control group (n=57)	
Age (years)			0.81
7	6 (11.8)	7 (12.3)	
8	9 (17.6)	11 (19.3)	
9	10 (19.6)	11 (19.3)	
10	11 (21.6)	12 (21.1)	
11	10 (19.6)	11 (19.3)	
12	5 (9.8)	5 (8.8)	
Sex			0.69
Male	33 (64.7)	40 (70.2)	
Female	18 (35.3)	17 (29.8)	
Type of surgery performed			0.89
Circumcision	17 (33.3)	17 (29.8)	
Herniorrhaphy	8 (15.7)	6 (10.5)	
Eye operation	7 (13.7)	8 (14.0)	
Ear, nose, and throat operation	7 (13.7)	16 (28.1)	
Dental operation	5 (9.8)	8 (14.0)	
Orthopaedic operation	7 (13.7)	2 (3.5)	
Parents' education attainment			0.27
Primary school or below	4 (7.8)	12 (21.1)	
Lower secondary school	15 (29.4)	16 (28.1)	
Upper secondary school	22 (43.1)	21 (36.8)	
University or above	10 (19.6)	8 (14.0)	
Mean±SD State Anxiety Score of children	16.67±3.42	16.33±3.24	0.60
Mean±SD State Anxiety Score of parents	36.67±7.51	36.21±6.88	0.74

* *t* test for continuous variable and Chi-square test for nominal and categorical variables

TABLE 3. Split-plot analysis of variance on State Anxiety Scores of children and parents across three time points (n=108)

Variable	State Anxiety Scores of children				State Anxiety Scores of parents			
	F value	P value	Eta squared	Observed power	*F* value	P value	Eta squared	Observed power
Main effect for time	307.79	0.00	0.85	1.00	370.61	0.00	0.88	1.00
Interaction effect	78.56	0.00	0.59	1.00	31.75	0.00	0.38	1.00
Main effect for intervention	6.08	0.02	0.06	0.82	2.59	0.11	0.03	0.61

for surgery. Return demonstration of the procedures on the doll enabled the children to practise the procedure of anaesthesia induction in an active rather than passive manner. This enabled the children to act out unpleasant experiences and minimise their negative emotional response, as lack of control is one of the major sources of stress for children undergoing surgery.[4] Therapeutic play intervention enhanced the children's sense of control through visiting the operating room so as to increase their familiarity with the environment. Through demonstration and return demonstration of the procedures of preparing for anaesthesia, the children became desensitised to these potential stressful situations and acquired a greater sense of control. Even though parents did not directly participate in the therapeutic play activities, they could also benefit from watching the activities as the explanations given to children would, in turn, make them feel more comfortable and well-informed.

The most important step in carrying out evidence-based nursing practice is to assess the potential implementation of an evidence-based innovation in clinical settings, including the transferability, feasibility, and cost-effectiveness of the innovation. Therapeutic play intervention can be transferable to all children regardless of different cultural backgrounds or settings. Play is instinctive, voluntary, and spontaneous; just like birds fly and fish swim.[5] Therefore, play is a very important part of children's lives even when they are ill. Therapeutic play intervention was feasible, as it was implemented on either Saturday afternoon, Sunday, or a public holiday in which no elective surgery was performed in the hospital, and it caused only minor disturbance to the operating theatre. Therapeutic play intervention was acceptable by children, parents, and health care professionals. Most children enjoyed the therapeutic play and found such activities full of fun and interesting. Besides, most parents commented that it was worthwhile and helpful to attend the therapeutic play intervention even though they had to spend extra time in the hospital. Additionally, most of the nurses agreed that therapeutic play is feasible to be implemented in the operating theatre provided that there is adequate support from the hospital organisation. Therapeutic play intervention is cost-effective, as its content is already very familiar to nurses. It took only an hour of a staff nurse's time to provide fairly comprehensive preoperative psycho-educational care to a group of children and their parents. It is economically feasible for the health care system to consider it as a routine nursing preparation of children for surgery.

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Effect of compression bandaging on wound healing and psychosocial outcomes in older people with venous ulcers: a randomised controlled trial

WKW So *, IKY Wong, DTF Lee, DR Thompson, YW Lau, DVK Chao, NF Heung, WL Au

KEY MESSAGE

Compression bandaging achieved a higher proportion of complete ulcer healing, reduced ulcer size, and improved psychosocial outcomes in venous ulcer patients. The four-layer bandaging and short-stretch bandaging systems achieved a similar effect on both ulcer healing and other psychosocial outcome measures.

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Venous ulcer is the most serious clinical consequence of chronic venous insufficiency. It is also known as varicose ulcer or stasis ulcer. Venous blood refluxes to the superficial venous system, resulting in abnormal elevation of venous pressure within the vein and eventually damages the skin. Venous ulcer affects approximately 1% to 2% of the total population in western countries,[1] and tends to increase with age.[2,3] It increases nurses' workloads and health costs and affects patients' physiological and psychosocial wellbeing. Compression bandaging is the mainstream treatment for venous ulcer, but it is not widely known and practiced by nurses in Hong Kong. The proportion of complete ulcer healing increases with compression bandaging, compared with no compression. Nonetheless, the effectiveness of the four-layer compression bandaging (4LB) versus the short-stretch compression bandaging (SSB) has not been determined. The effect of compression bandaging on the pain severity and pain interference, health-related quality of life (HRQOL), and functional status affects patients' participation in venous ulcer care and treatment choice. This study aimed to compare the 4LB, SSB, and usual care in terms of the time to complete ulcer healing, ulcer size, ulcer-related pain, functional status, and HRQOL in community-dwelling elderly patients with chronic venous ulcers.

A total of 321 patients aged ≥60 years who presented with a single unilateral venous ulcer with partial- or full-thickness skin integrity, in which the wound bed was free from necrotic tissue were randomised to receive SSB, 4LB, or usual care (without compression bandaging). Outcomes at 12 and 24 weeks were assessed.

Respectively for patients treated with SSB, 4LB, and usual care, 73.0%, 72.6%, and 30.8% achieved ulcer healing at week 12 (P<0.001, log-rank test), whereas 85.8%, 86.3%, and 33.5% achieved ulcer healing at week 24 (P<0.001, log-rank test). The median times for ulcer healing in the SSB and 4LB groups were 7.0 (standard error [SE], 0.61) weeks and 8.0 (SE, 0.38) weeks, respectively, which were shorter than >24 weeks in the usual care group (P<0.001, log-rank test). However, no significant difference was noted between the SSB and 4LB groups (P=0.578, log-rank test).

Respectively for patients treated with SSB, 4LB, and usual care, the mean ulcer size was 7.56 (SD, 10.43) cm², 7.54 (SD, 9.95) cm², and 9.23 (SD, 12.50) cm² at baseline (P=0.493, analysis of variance), and reduced to 3.00 (SD, 8.40) cm², 3.48 (SD, 8.54) cm², and 7.54 (SD, 12.45) cm2 at week 12, and further reduced to 2.85 (SD, 8.18) cm², 3.39 (SD, 8.64) cm², and 6.90 (SD, 10.62) cm² at week 24. Greater reductions were noted in patients treated with the SSB or 4LB. The reduction in ulcer size from baseline to week 12 was significant in all three groups (P≤0.001), whereas the reduction in ulcer size from week 12 to week 24 was significant in the SSB group only (P=0.047), but not in the 4LB group (P=0.67) and the usual care group (P=0.16).

For the psychosocial outcomes, changes in ulcer-related pain, functional status, generic and disease-specific HRQOL were compared among the three groups in a 24-week period. Age, ulcer duration, and ulcer size were controlled in the analysis. The rates of reduction in pain severity and interference,

and improvement in disease-specific HRQOL in the SSB and 4LB groups were greater than those in the usual care group.

Compression bandaging achieved significantly better healing and psychosocial outcomes than no compression. The choice of treatment for venous ulcer may depend on several factors such as clinical effectiveness, patient preference, and patient concordance.[4] Venous ulcer care is not merely about reduction of ulcer size, but also about reduction of pain and its interference in daily living, maintenance of HRQOL, and functional status. A holistic approach of biopsychosocial care is suggested for community-dwelling older patients with venous ulcer.

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Pressurised irrigation versus swabbing for wound cleansing: a multicentre, prospective, randomised controlled trial

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KEY MESSAGES

1. Pressurised irrigation is more cost-effective than swabbing for wound cleansing by shortening the wound healing time.

2. Patients experience less pain during wound cleansing by pressurised irrigation than swabbing.

3. Patients have more satisfaction on the comfort after wound cleansing with pressurised irrigation than swabbing.

4. The total direct medical cost of pressurised irrigation is lower than that of swabbing.

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Introduction

Pressurised irrigation for wound cleansing is advocated, as it can loosen debris, remove excess exudates, and reduce bacterial colonisation without traumatising the wound bed and hence impeding the healing process.[1] The use of the DeVilbiss Syringe (DeVilbiss Healthcare LLC, Somerset [PA], USA) connected to the Gomco Vacuum/Pressure Pump Model 309 (Allied Healthcare products, Inc., St Louis [MO], USA) can generate a steady stream at 4 to 15 psi, which is safe and effective pressure for wound cleansing.[2]

Methods

A multicentre, prospective, randomised controlled trial was conducted in four out-patient clinics in the New Territories East Cluster of the Hospital Authority from April 2008 to August 2010. A total of 256 patients were randomised to receive pressurised irrigation (n=122) or swabbing (n=134) for wound cleansing. Patients were excluded if they had unbroken skin, full-thickness skin loss, damage to muscle, bone, and/or any supporting structures, wounds with a sinus, wounds to be healed by primary intention, wounds that were prescribed to be cleansed by pressurised irrigation, more than one wound, a very poor life expectancy, or a clinical condition that might interfere with wound healing.

Wounds were assessed at enrolment and upon healing (or after 6 weeks if the wounds had not healed). Primary outcome measures included time to wound-healing, change of wound size, and proportion of wounds healed completely within 6 weeks. Secondary outcome measures included infection rate during follow-up, patient perceived wound symptoms, patient satisfaction with the cleansing method, health-related quality of life (HRQOL), and cost. The intention-to-treat principle was used. The two groups were compared using the log rank test, Pearson Chi-square test, Fisher's exact test, Mann-Whitney U test, or independent t-test as appropriate.

Cost-effectiveness analysis of wound healing was performed for those who completed the treatment. The total direct medical cost of wound dressing per patient was estimated by arithmetic mean. Mean time to complete wound healing estimated by the approach of Efron was used as the effectiveness measure. Biased-corrected and accelerated bootstrapping with 5000 replications was used to estimate the 95% confidence intervals (CIs) of the mean difference in the medical cost and time to complete wound healing between the pressurised irrigation and swabbing.

Results

Of the 256 patients, 39 (15.2%) were withdrawn: 15 in each group were lost to follow-up, and one in the pressurised irrigation group and eight in the swabbing group were due to adverse events. The two groups were similar in terms of baseline characteristics (Table 1).

Respectively in the pressurised irrigation and swabbing groups, 82.0% and 78.4% of wounds healed

within 6 weeks (Table 2), and the median times to complete wound healing were 9.0 (95% CI, 7.4-10.6) days and 12.0 (95% CI, 10.2-13.8) days (P=0.007, log rank test), whereas the mean times to complete wound healing were 11.4 and 14.5 days, with a saving of 3.1 (95% CI, 0.3-5.9) days.

The two groups did not differ significantly in terms of five wound symptoms (wound pain, fluid leaking from wound cleansing, bleeding, smell, and itchiness), except for pain during wound cleansing (P=0.020). The two groups also did not differ significantly in terms of the level the patient's life being interfered with by the six wound symptoms (Table 3).

Patients in the pressurised irrigation group had higher satisfaction scores after wound cleansing in terms of cleanliness (P=0.161), comfort (P=0.002), and overall satisfaction (P<0.001) [Table 4].

The two groups did not differ significantly in terms of HRQOL according to the Short Form–12 subscale scores of physical functioning, role physical, bodily pain, general health, vitality, social functioning, role emotional, and mental health (Table 5).

Respectively in the pressurised irrigation and swabbing groups, the mean total direct medical costs per patient were HK$244±283 and HK$354±882, with a saving of HK$110 (95% CI, HK$ -33 to 308) [Table 6].

In the cost-effectiveness plane displaying the distribution of incremental costs and effects of the bootstrapped results of 5000 replications, 90% of the bootstrapped cost-effectiveness pairs were located in the south-east quadrant, indicating that pressurised irrigation was dominantly more effective and less expensive than swabbing for wound cleansing (Fig).

Discussion

Pressurised irrigation for wound cleansing enabled shorter wound healing time, less pain during wound cleansing, and more patient satisfaction. Benefits of pressurised irrigation have been reported to be promoting wound healing and patient comfort,[3] and shortcomings of swabbing involve the deleterious effects on tissue owing to the extra pressure applied on to the wound affecting the healing of wounds.[3,4]

Although the nurses performing the dressing change were aware of the cleansing method used, the bias in outcome assessment was minimised by having a second assessor. When wounds showed signs of infection as determined by Cutting's criteria,[5] patients were referred to a physician blinded to the method of wound cleansing and study purpose.

The glass bottle and stainless steel nozzle of the pressurised irrigation device were reusable. Although samples of saline were not tested to determine whether there was contamination, the

TABLE I. Demographics of patients

Variable	No. (%) of patients	
	Pressurised irrigation (n=122)	Swabbing (n=134)
Sex		
Male	76 (62.3)	99 (73.9)
Female	46 (37.7)	35 (26.1)
Mean±SD age (years)	47.9±18.2	47.1±17.1
Education level		
Primary school or below	48 (39.3)	50 (37.3)
Secondary school	64 (52.5)	70 (52.2)
Tertiary school or above	10 (8.2)	14 (10.4)
Employment		
Employed full-time	58 (47.5)	58 (43.3)
Retired	26 (21.3)	36 (26.9)
Other	38 (31.1)	40 (29.9)
Mean±SD body mass index (kg/m^2)	23.7±3.7	23.8±4.2
Known chronic disease	32 (26.2)	43 (32.1)
Smoking		
Current smoker	24 (19.7)	19 (14.2)
Ex-smoker	18 (14.8)	21 (15.7)
Median (interquartile range) initial wound size (cm^2)	1.7 (0.6-6.6)	2.0 (0.8-9.5)
Median (interquartile range) time from wound onset to treatment (days)	5 (3-9)	6 (3-14)
Mean±SD overall wound status score	27.4±3.6	28.1±3.8
Wound type		
Trauma	41 (33.6)	36 (26.9)
Burn/scald	20 (16.4)	25 (18.7)
Surgical	23 (18.9)	21 (15.7)
Leg ulcer	2 1.6)	10 (7.5)
Dog bite	4 (3.3)	6 (4.5)
Other	32 (26.2)	36 (26.9)
Wound site		
Upper extremity	54 (44.3)	52 (38.8)
Lower extremity	57 (46.7)	61 (45.5)
Trunk	8 (6.6)	16 (11.9)
Head/neck	3 (2.5)	5 (3.7)
Wound characteristics		
Delayed healing due to bacteria	0 (0)	1 (0.7)
Wound with risk of infection	2 (1.6)	2 (1.5)
Discolouration of granulation tissue	0 (0)	1 (0.7)
Foul odour	0 (0)	0 (0)
Infection in wound and antimicrobial treatment		
Yes	24 (19.7)	37 (27.6)
No	98 (80.3)	97 (72.4)

TABLE 2. Wound healing outcomes on an intention-to-treat basis

Variable	Pressurised irrigation (n=122)	Swabbing (n=134)	P value
% of wounds healed completely	82.0	78.4	0.470 (Chi-square test)
Median (interquartile range) time to complete wound healing (days)*	9.0 (7.4-10.6)	12.0 (10.2-13.8)	0.007 (log rank test)
Median (interquartile range) reduction of wound area (cm^2)	1.3 (0.3-6.3)	1.4 (0.3-6.9)	0.701 (Mann-Whitney U test)
Median (interquartile range) % of wound area reduction	100 (100-100)	100 (100-100)	0.225
Infection rate during follow-up (%)	3.3	5.2	0.443 (Chi-square test)

* Estimated median (95% CI) time to complete wound healing by the Kaplan-Meier method

TABLE 3. Patient perceived wound symptoms and levels of life interference by wound symptoms

Variable	% of patients		P value
	Pressurised irrigation (n=122)	Swabbing (n=134)	
Wound symptom			
Pain over wound			
No/mild	81.1	80.6	0.911 (Chi-square test)
Moderate/severe/very severe	18.9	19.4	
Pain during wound cleansing			
No/mild	93.4	84.2	0.020 (Chi-square test)
Moderate/severe/very severe	6.6	15.8	
Fluid leaking from wound cleansing			
No/mild	86.1	85.1	0.822 (Chi-square test)
Moderate/severe/very severe	13.9	14.9	
Wound bleeding			
No/mild	97.5	96.3	0.725 (Fisher's exact test)
Moderate/severe/very severe	2.5	3.7	
Wound smell			
No/mild	99.2	99.3	0.999 (Fisher's exact test)
Moderate/severe/very severe	0.8	0.7	
Itchiness over wound or surrounding skin			
No/mild	73.8	79.9	0.249 (Chi-square test)
Moderate/severe/very severe	26.2	20.1	
Life interfered by wound symptom			
Pain over wound			
Not at all/a little bit	78.7	82.8	0.400 (Chi-square test)
Somewhat/quite a lot/very much	21.3	17.2	
Pain during wound cleansing			
Not at all/a little bit	95.1	91.0	0.201 (Chi-square test)
Somewhat/quite a lot/very much	4.9	9.0	
Fluid leaking from wound cleansing			
Not at all/a little bit	95.1	95.5	0.868 (Chi-square test)
Somewhat/quite a lot/very much	4.9	4.5	
Wound bleeding			
Not at all/a little bit	97.5	98.5	0.671 (Fisher's exact test)
Somewhat/quite a lot/very much	2.5	1.5	
Wound smell			
Not at all/a little bit	99.2	100.0	0.477 (Fisher's exact test)
Somewhat/quite a lot/very much	0.8	0.0	
Itchiness over wound or surrounding skin			
Not at all/a little bit	91.8	93.3	0.652 (Chi-square test)
Somewhat/quite a lot/very much	8.2	6.7	

TABLE 4. Patient satisfaction

Patient satisfaction*	Median (interquartile range)		P value (Mann-Whitney U test)
	Pressurised irrigation (n=106)	Swabbing (n=111)	
Cleanliness after wound cleansing	6 (5-6)	5 (5-6)	0.161
Comfort after wound cleansing	6 (5-6)	5 (5-6)	0.002
Overall wound cleansing method	6 (5-6)	5 (5-5)	<0.001

* Rated by 6-point Likert scale from 1 (very unsatisfactory) to 6 (very satisfactory)

TABLE 5. Patient health-related quality of life

Short Form–12 subscale scores	Mean±SD		P value (independent samples t-test)
	Pressurised irrigation (n=106)	Swabbing (n=111)	
Physical functioning	65.1±28.6	67.3±25.2	0.539
Role physical	23.6±42.1	22.1±40.8	0.788
Bodily pain	59.2±28.3	57.2±30.4	0.619
General health	47.8±26.9	50.0±28.0	0.553
Vitality	69.4±28.6	70.3±28.0	0.828
Social functioning	71.9±36.3	74.5±34.0	0.584
Role emotional	62.7±42.6	64.9±40.8	0.707
Mental health	71.9±23.7	72.8±25.1	0.785

TABLE 6. Comparison of costs between pressurised irrigation and swabbing*

Cost (HK$)	Pressurised irrigation group (n=106)	Swabbing group (n=111)	Mean difference (95% CI)
Cost for sterile dressing set (with forceps) [1]	21.8±24.7	27.2±28.9	
Cost for sterile gauze (2)	0.53±0.94	0.30±1.17	
Cost for sterile cotton wool ball (3)	0.00±0.04	0.22±1.00	
Cost for normal saline (4)	1.10±1.09	0.99±1.16	
Basic cost for wound cleansing materials (1+2+3+4)	**23.4±25.6**	**28.7±30.6**	
Cost for dressing fixation materials (5)	37.4±150.8	126.2±716.8	
Cost for supplementary dressing materials (6)	53.5±158.1	153.0±764.7	
Nursing time spent in dressing (minutes)	57.5±60.1	59.4±73.7	
Cost for nurse labour* (7)	166.7±174.4	172.1±213.7	
Total cost: materials + labour (1+2+3+4+5+6+7)	**243.7±283.2**	**353.8±882.0**	**110.1 (-32.8-308.3)†**
Mean (SE) time to complete wound healing‡ (days)	11.4 (1.0)	14.5 (1.1)	3.1 (0.3-5.9)†

* Nursing time spent in dressing times HK$2.9 (HK$2.9=nurse cost in 1 minute for an average salary of HK$30 604 per month)
† 95% CI were estimated using bootstrap method
‡ Estimated by the approach of Efron

infection rates for the two cleansing methods did not differ significantly.

Of the nine adverse events, eight were from the swabbing group and its infection rate may have been underestimated. Most wounds were trauma wounds, burns/scalds, and surgical wounds; this may have been due to the demographics of the population.

Costs for chronic wounds are considerably higher than those for all acute wounds. This may create variability of central tendency in the cost analysis. The dressing packs used for swabbing generate unnecessary waste from the disposal of unused items such as swabs, gauze, and wrappings. The waste disposal landfill is expensive. These financial and environmental liabilities of waste disposal make reducing non-hazardous waste
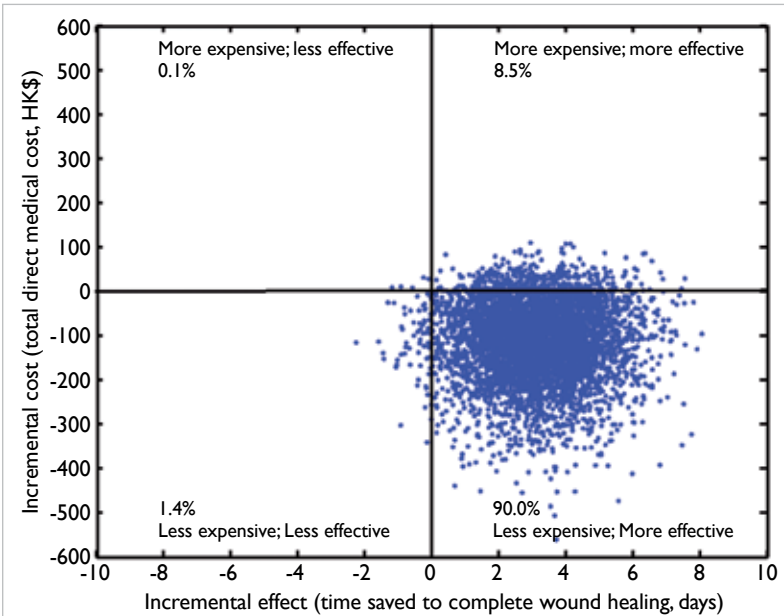
FIG. Cost-effectiveness plane showing 90% of the bootstrapped cost-effectiveness pairs in the south-east quadrant, indicating that pressurised irrigation is dominantly more effective and less expensive than swabbing

Conclusions

Compared with swabbing, pressurised irrigation is more cost-effective for wound cleansing in terms of shorter time of wound healing, less pain during wound cleansing, higher patient satisfaction, and lower total direct medical cost.

Acknowledgements

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imperative. Dressing changes can be performed with clean, reusable instruments such as the self-modified pressurised irrigation device.

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