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Day care versus inpatient management of nausea and vomiting of pregnancy: cost utility analysis of a randomised controlled trial☆

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ABSTRACT

Objective: To assess the comparative cost effectiveness of day care over inpatient management of nausea and vomiting of pregnancy (NVP).

Study design: A cost utility analysis was performed using a decision analytical model in which a Markov model was constructed. The Markov model was primarily populated with data from a recently published randomised controlled trial. Which included pregnant women presenting to Cork University Maternity Hospital, a tertiary referral maternity hospital, seeking treatment for NVP. Costs and outcomes were estimated from the perspective of the Irish health service (HSE) and patients. A probabilistic sensitivity analysis, using a Monte Carlo simulation, was also performed. A Bayesian Value of Information analysis was used to estimate the value of collecting additional information.

Results: When both the healthcare provider and patient's perspective was considered, day care management of NVP remained less costly (mean €985; 95% C.I. 705–1456 vs. €3837 (2124–8466)) and more effective (9.42; 4.19–12.25 vs. 9.49; 4.32–12.39 quality adjusted life years) compared with inpatient management. The Cost Effectiveness Acceptability Curve indicates the probability that day care management is 70% more cost effective compared to inpatient management at a ceiling ratio of €45,000 per QALY, indicating little decision uncertainty. The Bayesian Value of Information analysis indicates there is value in collecting further information; the Expected Value of Perfect Information (EVPI) is estimated to be €5.4 million.

Conclusion: Day care management of NVP is cost effective compared to inpatient management.

Introduction

Nausea and vomiting of pregnancy (NVP) affects up to 80% of pregnant women [1–3]. Hyperemesis gravidarum, the more severe form of NVP is the commonest indication for admission to hospital in the first half of pregnancy [4–6]. The historical treatment for NVP is inpatient admission during which time treatment is based on correcting electrolyte imbalance and dehydration, prophylaxis against recognised complications and providing symptomatic relief [7]. According to the Irish Casemix Programme, in 2011 the inpatient costs of NVP were estimated to be over €3 million [8]. In addition, there are other factors such as emergency department attendances, potential complications resulting from NVP and the opportunity cost associated with women's time spent in hospital.

In other clinical settings day care management of conditions such as hypertension in pregnancy has been demonstrated to be beneficial, safe and feasible for patients [9,10]. A recently published randomised controlled trial demonstrated that day care treatment of NVP reduced hospital inpatient stay and was acceptable to patients compared with inpatient management [11]. The RCT randomised 98 patients between day care and inpatient management using a computer-generated randomisation list in Cork University Maternity Hospital (CUMH), a tertiary referral hospital.

☆ Trial registration: ISRCTN05023126.

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Initial evaluation was identical after which patients were consented and randomised to either initial treatment with day care or inpatient management. Day care treatment took place in the day ward (Monday–Friday, 8 am–4 pm) or in the emergency room in CUMH. Primary outcome for the study was total number of inpatient nights related to nausea and vomiting of pregnancy [11]. Patients randomised to day care received 2 L of fluid (normal saline) intravenously over 5 h. Antiemetics were administered when patients failed to respond to intravenous fluid administration and administered using a standardised, pretyped stepwise drug ProForma patients randomised to inpatient admission received 1 L of fluid (normal saline) administered over 3 h. The patient then received 1 L of fluid (normal saline) intravenously every 6 h until able to tolerate oral fluids. Similar to day care, antiemetics were administered in an identical stepwise approach. No differences were observed in patient characteristics and demographics between treatment arms. Women randomised to inpatient care had significantly more median total number of inpatient admissions compared with women randomised to day care. No significant differences were observed in day care visits. Women randomised to inpatient care were as satisfied with their care as those randomised to day care [11]. This study examined the cost effectiveness of managing NVP with day care compared with inpatient management using a decision analytical model, populated with evidence from this randomised controlled trial. Furthermore, the value of collecting additional information was estimated using Bayesian Value of Information analysis.

Materials and methods

The economic analysis presented here employed a decision analytical model to assess the cost-effectiveness of day care (intervention) compared to inpatient management (comparator) of NVP. The Markov model constructed for this study (Fig. 1) consisted of three health states: Healthy, Moderate NVP and Severe NVP over 52 days. This period was divided into a series of discrete time periods referred to as cycles, which represented each episode of care for NVP. Moderate NVP requiring medical attention referred to the health state at which the woman arrives to the hospital seeking medical attention for NVP. Thereafter, she moves to the Severe state if admission is required or moves to the Healthy state if discharged. If a woman moves to the Severe state she remains there for the duration of the cycle after which she is moves to the Healthy state. Following discharge there is a chance that NVP would recur resulting in the woman re-presenting to hospital. In all, there are 13 cycles in the model (that is to say 12 chances of re-presenting) and each cycle lasts four days (as per maximum inpatient stay for NVP) [12]. Thus the duration of the model is 52 days and the first four days are cycle 1, second four days are cycle 2 etc. This model structure was applicable to both the intervention and the comparator. The transition probabilities (presentation, admission and length of stay) for the intervention and comparator were estimated using the primary data collected in McCarthy et al. (Appendix S1). For example, amongst those receiving inpatient management in cycle 1 all 55 patients presented so the probability of presenting with moderate NVP was 1.00, in cycle 2 25 presented giving a probability 0.45. This was repeated for the remaining cycles and for day-care treatment. In addition, the probability of admission to the hospital with NVP in each cycle was estimated for each treatment. For example, for those receiving inpatient treatment in cycle 1, 54 of the 55 patients were admitted giving a transition probability of 0.98. In cycle two, of the 25 patients who presented 15 were admitted giving a probability of admission of 0.60. This was estimated for all cycles for both treatments – see Appendix S1.

Costs assessed, from both the health care provider and patient perspectives, included the cost of treatment as a day care patient (€124); and as an inpatient (€870) [8,12], patient's travel costs and opportunity cost of patient's time. The RCT reported average distance travelled as 28.3 km (standard deviation 30.23) [11]. These were valued using the public sector reimbursement rate of €0.16 km^{-1} [13]. The average industrial wage (€21.78) [14] was used as an estimate of the opportunity cost of patients' time (applied for 16 h in the case of inpatients) (see Appendix S1 for length of stay). Mean patient costs associated with day care management were €391 and inpatient management were €1704.

Utilities were assigned to each state in the Markov model to estimate quality adjusted life years (QALYs) using a mix of primary

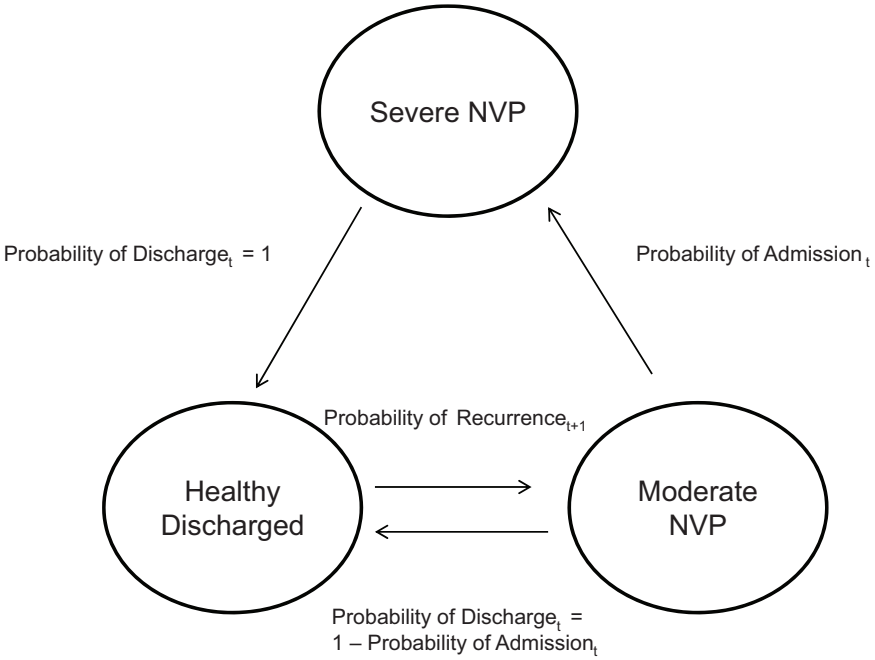

Fig. 1. Decision analytical model – Markov model: day care versus inpatient management of NVP.