Cancer Care Coordinators in Colon Cancer
evaluating its cost-effectiveness in stage III colon cancer

SUMMARY

Cancer services can be difficult for patients to navigate. If patients receive the cancer services they need in a timely manner, they can have better health outcomes. There is growing interest in cancer care coordinators (CCCs), who help coordinate various cancer services for individual patients. This pamphlet evaluates the cost-effectiveness of nurse CCCs for managing stage III colon cancer.

We evaluated CCCs in managing stage III colon cancer

In stage III colon cancer, the cancer has spread to regional lymph nodes but has not metastasised. Patients with stage III colon cancer usually need surgery, followed by chemotherapy. Normally, doctors, nurses, and other health staff help coordinate cancer services for patients as best they can. In our model, we tested the idea of a single dedicated clinical nurse specialist (nurse CCC) working with stage III colon cancer patients to:

- provide support and information
- coordinate treatment
- identify any barriers that stopped patients receiving timely treatment
- address these barriers

We used a simulation model to estimate cost-effectiveness using NZ data

The model estimates how much health benefit is gained (in quality-adjusted life years or QALYs) from a nurse CCC in stage III colon cancer, and how much it costs or saves the health system. These are combined into a single Incremental Cost-Effectiveness Ratio or ICER.

Main health gain is through more people getting chemotherapy and getting to it faster

With a nurse CCC, we estimated that 33% more patients get chemotherapy, and patients get to chemotherapy 20% quicker. A nurse CCC may also reduce patient anxiety. A nurse CCC itself is not expensive, as it saves the time normally spent by other health staff coordinating cancer services. The main cost is through more people getting chemotherapy, which is expensive. The overall cost of a nurse CCC to the health system compared to usual practice was an additional NZ$ 2,271 per patient.

Is it cost-effective?

In our best model, we estimated cost-effectiveness at NZ$ 18,900 per QALY gained, ranging from NZ$ 13,400 to NZ$ 24,600. Using international guidance for cost-effectiveness, a nurse CCC in stage III colon cancer appears to be cost-effective in the New Zealand setting.

Our bottom line

If the Government is willing to pay at least NZ$ 30,000 to gain a QALY, a nurse CCC in stage III colon cancer is almost 100% likely to be cost-effective. It is difficult to generalise from our model to other types of CCCs or other cancers. However, if the intervention being considered helps more patients get effective cancer treatments (and more quickly), it may be cost-effective for other types of cancer as well.

IN MORE DETAIL

Cancer Services are Complex

Cancer care services can be difficult for patients to navigate, especially disadvantaged patients. If patients receive the cancer services they need in a timely manner, they tend to have better health outcomes. We need to consider better ways of delivering cancer care services. Also, cancer care costs are rising. Decision-makers need research that helps them prioritise how best to use available cancer control resources.

Cancer Care Coordinators (CCCs)

As cancer care services have become more complex, there has been growing interest in cancer care coordinators or CCCs. CCCs are often known by different names: patient navigators, key workers, liaison officers, case management nurses, etc. CCC roles can also vary in terms of what stage of cancer management they focus on: from access to cancer screening, to coordination of care following a cancer diagnosis, to survivorship support.

In our model, a CCC is a hospital-based clinical nurse specialist who works with patients diagnosed with stage III colon cancer. These patients generally need surgery followed by chemotherapy. The nurse CCC:

- provides support and information
- coordinates treatment
- identifies any barriers that stop patients receiving treatment
- addresses these barriers

We compared the nurse CCC to usual practice, where doctors, nurses, and other staff help coordinate cancer services for patients as best they can (but without a dedicated resource).

Model

We began with a NZ population of stage III colon cancer patients in 2011. We used a discrete event simulation model to follow this population through to death or 110 years. We modelled this population as they moved through competing health events: time to surgery, time to chemotherapy, death from colon cancer, or death from other causes. The model estimated:

- Health gain in quality-adjusted life years or QALYs

- Health system costs in NZ$

- Cost-effectiveness in Incremental Cost-Effective Ratios (compared to usual practice)

Assumptions in the Model

Our model contains multiple assumptions. Some of these assumptions apply across all BODE[3] evaluations, and are described in a range of protocols at the BODE[3] website here. Some assumptions are specific to this topic: please email tony.blakely@otago.ac.nz for more information.

Some of our key assumptions include the following:

- We used a health system perspective and so did not include costs and consequences beyond the health system (such as productivity costs).
- We allowed for expected or background disease and limited the maximum amount of QALYs that could be gained with increasing age.
- We applied a 3% discount rate to costs and QALYs gained.
- We estimated the baseline waiting times from diagnosis to surgery and from surgery to chemotherapy by using data from a previous NZ hospital notes review study of over 600 colon cancer patients diagnosed between 1996-2003.
- In order to estimate the effect of CCCs on increasing coverage of cancer treatments and reducing time to cancer treatments, we combined the limited evidence with estimates from NZ experts.

> **QALY or Quality-Adjusted Life Year:**
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> The remaining life expectancy, adjusted for quality of life. Think of one QALY as one year of life in perfect health.

> **ICER or Incremental Cost-Effectiveness Ratio:**
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> The difference in costs between one intervention and its comparator, divided by the difference in health gain. An ICER tells you how much more (or less) cost-effective an intervention is compared to something else.

- To determine the time spent on coordinating activities in usual practice, we estimated the proportion of a staff member's time spent coordinating. We then calculated the cost per minute of activity being carried out based on their average salaries (plus 50% overheads).

QALYs, Costs & Cost-Effectiveness

QALYs

With a nurse CCC, we estimated that 33% more patients get chemotherapy and patients get to chemotherapy 20% quicker compared to usual practice. Translating this into QALYs, each patient gains 0.121 QALYs (ranging from 0.070 to 0.185 QALYs). This can be thought of as 6.3 extra weeks of life in perfect health.

Costs

The main cost was not of the nurse CCC itself, this was offset by savings in time usually spent by other health staff coordinating treatments. The main cost was the cost of more patients getting chemotherapy. The overall cost of a nurse CCC to the health system compared to usual practice was an additional NZ$ 2,271 per patient (ranging from NZ$ 1,225 to NZ$ 3,641).

Cost-Effectiveness

A nurse CCC in stage III colon cancer appears to be cost-effective compared to usual practice (ICER of NZ$ 18,900 per QALY, ranging from NZ$ 13,400 to NZ$ 24,600).

## A Note on Cost-Effectiveness Thresholds and Willingness-To-Pay

There is no consensus on a cost-effectiveness threshold in NZ. Our statements on cost-effectiveness stem from World Health Organization guidance, which is based on Gross Domestic Product (GDP) per capita. In NZ, GDP per capita is approximately NZ$ 40,000. If the ICER for an intervention is less than NZ$ 40,000 per QALY, we deem it cost-effective. However, our evaluations also make allowance for other thresholds, as shown below. It should also be noted that policy decisions are made on multiple considerations, and cost-effectiveness is only one of these.

> Cost-effectiveness Threshold or Willingness-To-Pay:
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> Society's willingness to pay for an extra unit of health gain e.g. a QALY. If the ICER for an intervention is less than the threshold, the government can view it as cost-effective and may fund it. If ICER is greater than the threshold, it is not deemed to be cost-effective and the government may not fund it.

Cost-Effectiveness Acceptability Curve

There is always uncertainty around the estimates of cost-effectiveness. There is also variation in how much the Government is willing to pay to gain 1 QALY. The graph below is a cost-effectiveness acceptability curve which takes both these factors into account. At different levels of willingness-to-pay, it shows the probability of a nurse CCC in stage III colon cancer being the optimal intervention compared to usual practice.
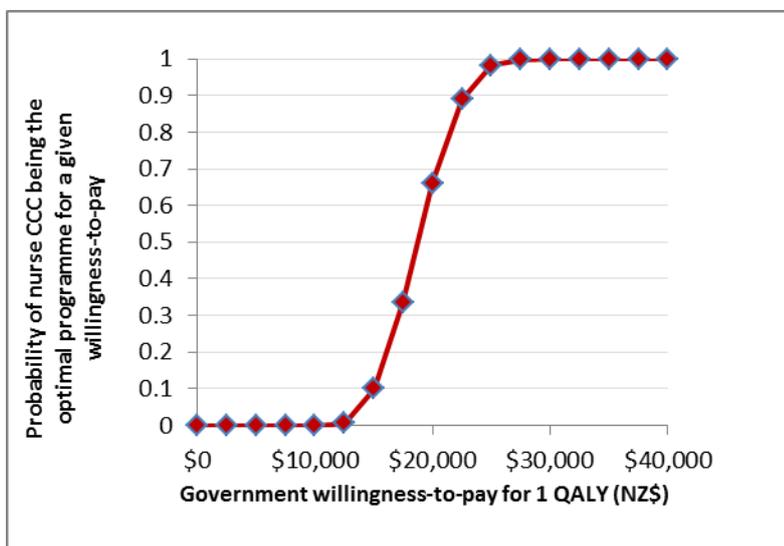
The graph shows that if the Government is willing to pay at least NZ$ 30,000 to gain a QALY, a nurse CCC in stage III colon cancer is almost 100% likely to be the optimal intervention compared to usual practice.

Costs, QALYs & Cost-Effectiveness in Different Populations

Age

Greater QALY gain and more cost-effective for patients under 65 years (NZ$ 9,400 per QALY gained) than over 65 years.

Ethnicity

Greater QALY gain for Māori but higher costs as well so slightly less cost-effective for Māori (NZ$ 22,800 per QALY gained). However, similar cost-effectiveness after equity analysis (see below).

Deprivation

Similar cost-effectiveness for most deprived patients as compared to least deprived.

Equity Analysis

Māori have higher background disease and death compared to non-Māori. Māori are thus automatically disadvantaged in economic evaluations because Māori have a limited envelope of QALYs that can be gained. We conducted an 'equity analysis' to adjust for this, applying non-Māori rates of background disease and death to Māori instead of using Māori rates. Cost-effectiveness for Māori improved to be comparable with that of non- Māori (NZ$ 15,100 per QALY gained).

Uncertainty in our Results

There is unavoidable uncertainty present in the values we put into our models, and thus uncertainty in estimates of costs, health gains, and cost-effectiveness (reflected in the ranges provided). The most uncertainty came from how much quicker patients got to chemotherapy, how many more patients got to chemotherapy, how much patient survival improved by getting chemotherapy quicker, and how much chemotherapy costs per patient.

Changing Some Assumptions

The results of the evaluation are sensitive to different assumptions. For example:

What if we exclude future health system costs unrelated to cancer?

The cost drops and cost-effectiveness improves to NZ$ 16,000 per QALY gained.

What if we ignore background disease as one ages?

Cost-effectiveness improves to NZ$ 14,800 per QALY.

What if we discounted at different rates?

At a discount rate of 0%, cost-effectiveness improves to NZ$ 17,100 per QALY gained.
At a discount rate of 6%, cost-effectiveness declines to NZ$ 23,600 per QALY gained.

Our Bottom Line

1 Judging by international guidance on cost-effectiveness, a nurse CCC in stage III colon cancer appears to be cost-effective in the NZ setting.

2 It is difficult to generalise from our model to other types of CCCs and other cancers. However, if the intervention being considered helps more patients get effective cancer treatments (and more quickly), it may be cost-effective for other types of cancer as well.