A RE-EXAMINATION OF DRUG COSTS FOR CETUXIMAB AND PANITUMUMAB IN METASTATIC COLORECTAL CANCER: ASSESSING THE INFLUENCE OF DRUG VIAL SPLITTING

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Objective:

A 2017 Brazilian cost-effectiveness analysis (CEA) of cetuximab, panitumumab and best supportive care indicated neither drug was cost-effective in a Brazilian "average patient." A patient of a particular height and weight was assumed to use drug quantity needed (discarding the remainder of any unused vial) but assigned an entire vial's cost. An alternative assumption is that groups of patients are dosed together, allowing vial sharing– no wastage of drug. As cetuximab is dosed based on a combination of height and weight - body surface area (BSA) and panitumumab by weight, this assumption and dosing differences could have a differential effect on costs by treatment and could affect cost-effectiveness.

Methods:

The estimated dose and the costs related with the dose wastage and no wastage are calculated for an average patient in cetuximab and panitumumab. The required dose is given as 500 mg/m^2 for cetuximab and 6 mg / kg for panitumumab. From this and drug administered data we determined the height and weight the authors assumed for their analysis. The average body surface area is calculated using De-bois formula: $0.007184 \times height\ (cm)^{0.725} \times weight\ (kg)^{0.425}$. The averages used in the article were 70 kg and 1.75m^2, implying an average height of 162cm using this formula. We determined that this "average patient" of the article corresponded to the average female in Brazil; costs for the average male would be proportionally higher.

The estimated dose for cetuximab is calculated by multiplying the required dose (500 mg/m^2) by the BSA (1.75m^2). This dose is thus 875 mg and the total number of 100 mg vials needed is 9 with wastage. The unit vial cost is $166.70. Only 875 mg are needed for proper dosing – no wastage, then the costs are 8 full vials at full cost plus 75/100 of a 9th vial's cost are counted for the patient. The vials needed for no drug wastage is 8.75. The remaining drug in the 9th vial is 25 mg, this cost is assumed to go to the next patient to be treated. The total cost per application in the two scenarios (wastage, no wastage) is calculated by multiplying unit vial cost ($166.70) by the vials needed in cetuximab. The estimated dose for panitumumab is calculated by multiplying the required dose (6 mg/kg) by the average weight (70kg). This dose is thus 420 mg and the total number of 100mg vials needed is 5 with wastage. The unit vial cost is $270.43. Only 420 mg are needed for proper dosing – no wastage, then the costs are 4 full vials at full cost plus 20/100 of a 5th vial's cost are counted for the patient. The vials needed for no drug wastage is 4.20. The remaining drug in the 5th vial is 80 mg, this cost is assumed to go to the next patient to be treated. The total cost per application in wastage and no wastage of drug is calculated by multiplying unit vial cost ($270.43) by the vials needed in panitumumab.

Results:

For panitumumab the average patient needed 5 vials and wasted 80 mg. For cetuximab, 9 vials were needed (25 mg wastage). Using the wasted drug on another patient showed differential effect on the two drug costs.

For biweekly treatment, panitumumab savings were $216.34 and cetuximab's were $41.68. Quarterly drug costs are calculated by multiplying the total costs by 6. Therefore, the quarterly costs declined by $1298 for panitumumab and $250 for cetuximab.

	Cetuximab	Panitumumab
Dose	500 mg/m^2	6 mg/kg
Total estimated dose	875 mg	420 mg
Vials needed (per 100mg)-wastage	9	5
Vials needed (per 100mg)-no wastage	8.75	4.20
left over dosage	25 mg	80 mg
Unit vial price (100mg) (US$)	$166.70	$270.43
Total cost per application - wastage	$1500.30	$1352.11
Total cost per application - no wastage	$1458.63	$1135.81

Table: Dose and cost for biweekly administration by an average patient in Brazil for cetuximab and panitumumab – with and without drug wastage.

Conclusion:

This research shows a potential benefit from a patient group dosing strategy which differs by drug for the average patient, in this case the average female. It is also clear that variation from the average patient height and weight will have variable implications on total drug costs and quantitative CEA results.

References:

Carvalho AC, Leal F, Sasse AD. Cost-effectiveness of cetuximab and panitumumab for chemotherapy-refractory metastatic colorectal cancer. *PLoS One*. 2017;12(4):e0175409. doi:10.1371/journal.pone.0175409