Evaluation of a clinical decision support system (CDSS) to optimize cytotoxic drug dosing in cancer patients with renal impairment

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Background

The incidence of renal impairment is ever increasing in cancer patients, since patients are getting older and more aggressive treatments become available. For those drugs in which renal excretion is an important determinant of elimination, dose adjustment is often required if renal function is impaired. “CS rules” is a cognitive clinical decision support system (CDSS) designed to assist clinical pharmacists in making dosing decisions for individual patients.

Methods

From September 2015 until January 2016 a pilot with the CDSS was performed in the ZGT Hospital in the Netherlands to optimize chemotherapy in patients with renal failure. Clinical rules were defined for 18 cytostatic drugs used in our hospital, for which dose reduction is required if renal function is impaired. For those same 18 drugs, rules were defined if the renal function recovered and a dose modification was necessary. The recommendations on chemotherapeutic dosing were consistent with the established guidelines and published evidence.

The CDSS was run overnight and generated alerts on all newly prescribed chemotherapeutics. Alerts were analyzed by the clinical pharmacist. If a dose reduction seemed necessary, the oncologist was contacted by the pharmacist and the necessity of a dose reduction or modification was discussed.

Results

During the pilot period a total of 2681 chemotherapeutics were prescribed, the 18 active rules generated 112 “impaired kidney function” alerts. Overall, 18.8 % of the generated clinical alerts resulted in an intervention by the clinical pharmacist about dose reduction due to impaired renal function. In table 1 a more detailed overview is given for the included cytostatic drugs and the generated number of alert and interventions.

The “recovered kidney function” rule resulted in a total of 22 alerts, however, in none of the alerts an intervention by the pharmacist was necessary .

Conclusions

The identification of patients at risk helps the clinical pharmacist and oncologist to optimize drug therapy in cancer in patient with renal dysfunction.

The “impaired kidney function” alerts resulted in valuable interventions by the pharmacist. In this pilot, however, the effect of the “recovered kidney function” rules was insignificant. Concluding, this study shows that a CDSS can effectively be used in daily hospital pharmacy practice to select patients at risk of cytotoxic drug overdose due to renal impairment.

Cytotoxic drugs	Prescriptions	Number of alerts (impaired kidney function)		Number of interventions by the pharmacist	
	n	n	%[a]	n	%[b]
Bortezomib	452	14	3.1	4	28.6
Cisplatin	133	27	20.3	5	18.5
Cyclophosphamide	482	3	0.62	0	0
capecitabine	429	22	5.1	4	18.2
Dacarbazine	20	0	0	0	0
Doxorubicin	395	0	0	0	0
Epirubicin	64	0	0	0	0
Etoposide	285	13	4.6	1	7.7
Fludarabine	1	4[c]	400	0	0
Ifosfamide	0	0	0	0	0
Hydroxycarbamide	0	0	0	0	0
Irinotecan	96	0	0	0	0
Lomustine	0	0	0	0	0
Melphalan	54	0	0	0	0
Mercaptopurine	0	0	0	0	0
Methotrexate	56	16	28,6	0	0
Pemetrexed	214	13	6.1	6	46.1
Procarbazine	0	0	0	0	0
Total	**2681**	**112**	**4.1**	**21**	**18.8**

Table 1: Overview of prescriptions, generated clinical alerts and interventions performed by the pharmacist.

a: as a percentage of number of prescriptions, b: as a percentage of alerts’ c: 4 alerts were generated after a single prescription of fludarabin.

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