Applicability and Feasibility of a Prediction Model in Detecting Hepatotoxic and Nephrotoxic Drug Side Effects

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INTRO

- Establishing standards of drug safety information analysis
- Setting up active monitoring system
- Securing network surveillance using Real World Data

METHODS

We used two prediction models which were developed using Patient-Level Prediction (PLP) framework provided by Observational Health Data Sciences and Informatics (OHDSI)

RESULTS

The generalized area under the receiver operating characteristic curve (AUROC) of drugs causing hepatotoxicity and nephrotoxicity was more than 0.6, having high performances. To illustrate, celecoxib was significantly effective in causing both hepatotoxicity and nephrotoxicity.

CONCLUSION

This comprehensive study indicated some of potential drugs which resulted in hepatotoxicity and nephrotoxicity as well as the applicability and feasibility of a prediction model across six different hospital databases.

Identifying **potential drugs causing side effect** as well as the **applicability and feasibility** of a prediction model across six different hospital databases.

Take a picture to **see** the **github code**

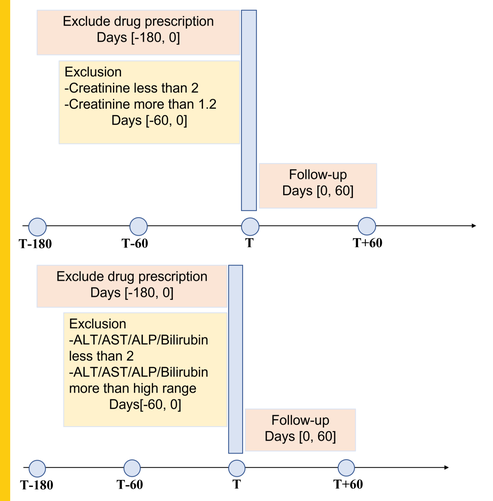

Fig 1. Study design detecting nephrotoxicity and hepatoxicity

Side effect	Institution	Drug	Model	AUROC	Interval	AUPRC	Target Size	Outcome Count
Nephrotoxicity	AjouUniv	acetaminophen	LASSO	0.693	(0.633-0.753)	0.193	3,339	304
		acetaminophen	GBM	0.698	(0.636-0.759)	0.199	3,339	304
		ibuprofen	LASSO	0.754	(0.661-0.846)	0.341	1,002	120
		ibuprofen	GBM	0.736	(0.635-0.837)	0.397	1,002	120
		naproxen	LASSO	0.682	(0.559-0.804)	0.318	620	97
		naproxen	GBM	0.562	(0.442-0.682)	0.191	620	97
		ketoprofen	LASSO	0.740	(0.584-0.897)	0.252	1,265	69
		piroxicam	LASSO	0.735	(0.628-0.842)	0.197	677	56
		celecoxib	LASSO	0.769	(0.604-0.933)	0.391	290	48
	Severance(gangnam)	acetaminophen	LASSO	0.717	(0.638-0.796)	0.209	2,181	189
		acetaminophen	GBM	0.769	(0.700-0.838)	0.256	2,181	189
	KangDongSacredUniv	acetaminophen	LASSO	0.867	(0.828-0.906)	0.461	3,603	310
		acetaminophen	GBM	0.850	(0.803-0.897)	0.467	3,603	310
		ketoprofen	LASSO	0.733	(0.609-0.857)	0.271	890	94
		ketoprofen	GBM	0.774	(0.660-0.887)	0.293	890	94
	KonyangUniv	acetaminophen	LASSO	0.750	(0.649-0.851)	0.167	2,319	97
		acetaminophen	GBM	0.745	(0.634-0.857)	0.135	2,319	97
	SeoulNatiUniv	vancomycin	LASSO	0.694	(0.598-0.791)	0.130	1,776	102
		vancomycin	GBM	0.697	(0.595-0.798)	0.154	1,776	102
		cisplatin	LASSO	0.585	(0.471-0.698)	0.297	683	135
		cisplatin	GBM	0.605	(0.489-0.721)	0.399	683	135
		acyclovir	LASSO	0.697	(0.562-0.833)	0.162	799	63
		ibuprofen	LASSO	0.656	(0.534-0.777)	0.219	546	81
		diclofenac	GBM	0.530	(0.377-0.682)	0.278	267	78
		celecoxib	LASSO	0.627	(0.492-0.763)	0.310	426	89
		celecoxib	GBM	0.668	(0.528-0.809)	0.470	426	89
	Severance(sinchon)	acetaminophen	LASSO	0.690	(0.640-0.740)	0.380	3,408	548
		vancomycin	LASSO	0.692	(0.573-0.811)	0.131	861	75
		vancomycin	GBM	0.709	(0.581-0.837)	0.151	861	75
		acetaminophen	GBM	0.678	(0.63-0.727)	0.355	3,408	548
		celecoxib	LASSO	0.736	(0.553-0.918)	0.337	247	42
Hepatoxicity	AjouUniv	candesartan	LASSO	0.740	(0.543-0.938)	0.147	8,999	41
		losartan	LASSO	0.880	(0.800-0.959)	0.209	8,886	64
		telmisartan	LASSO	0.884	(0.809-0.959)	0.137	9,006	52
		valsartan	LASSO	0.833	(0.725-0.942)	0.348	9,081	42
		valproate	LASSO	0.836	(0.752-0.919)	0.106	8,375	123
		valproate	GBM	0.815	(0.740-0.891)	0.087	8,375	123
	Severance(gangnam)	losartan	LASSO	0.759	(0.612-0.906)	0.013	8,199	37
	KangDongSacredUniv	celecoxib	LASSO	0.784	(0.633-0.936)	0.027	8,747	41
		valproate	LASSO	0.883	(0.832-0.935)	0.125	2,751	69
	KonyangUniv	celecoxib	LASSO	0.897	(0.855-0.939)	0.050	8,930	51
	SeoulNatiUniv	fimasartan	LASSO	0.754	(0.596-0.912)	0.019	7,271	35
		irbesartan	LASSO	0.799	(0.687-0.912)	0.038	7,573	57
		losartan	LASSO	0.884	(0.833-0.934)	0.031	9,051	58
		olmesartan	LASSO	0.967	(0.943-0.992)	0.182	8,809	53
		telmisartan	LASSO	0.810	(0.661-0.958)	0.034	8,843	46
		valsartan	LASSO	0.909	(0.857-0.960)	0.130	8,922	48
		celecoxib	LASSO	0.722	(0.518-0.925)	0.022	9,004	35
		valproate	LASSO	0.806	(0.711-0.901)	0.134	8,280	99
	Severance(sinchon)	meloxicam	LASSO	0.888	(0.786-0.990)	0.076	9,341	49
		candesartan	LASSO	0.806	(0.645-0.966)	0.070	9,420	45
		irbesartan	LASSO	0.796	(0.699-0.893)	0.011	8,842	35
		losartan	LASSO	0.784	(0.655-0.912)	0.015	9,277	49
		olmesartan	LASSO	0.779	(0.633-0.926)	0.015	9,222	49
		telmisartan	LASSO	0.823	(0.713-0.934)	0.035	9,096	56
		valsartan	LASSO	0.849	(0.788-0.911)	0.027	9,355	50
		celecoxib	LASSO	0.933	(0.878-0.987)	0.339	9,276	152
		celecoxib	GBM	0.935	(0.882-0.987)	0.326	9,276	152
		lamotrigine	LASSO	0.881	(0.767-0.995)	0.124	7,078	39

Table 1. Discrimination Performance of Two Prediction Models.

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