

# **Supplementary Materials**

## SUPPLEMENTARY TABLES

**Supplementary Table S1.** In-hospital death: Akaike’s Information Criterion.

	<b>Basic Model</b>	<b>Charlson</b>	<b>Elixhauer</b>	<b>Queralt DxS</b>	<b>APRDRG Risk</b>	<b>APRDRG Severity</b>	<b>APRDRG Risk*</b>	<b>APRDRG Severity*</b>	<b>Queralt Dx</b>
All	49,403	46,729	44,551	37,696	36,778	33,694	39,063	34,152	30,538
Colon cancer	486	439	406	378	394	330	388	327	327
Pancreatic cancer	467	422	406	320	367	334	360	328	289
Lung cancer	1,157	1,103	1,087	952	1,021	945	1,018	949	866
Leukemia	398	396	392	315	349	325	365	320	282
AMI	1,483	1,470	1,338	1,145	939	934	976	945	877
Arrhythmia	328	321	320	264	221	218	207	204	222
HF	2,668	2,653	2,562	2,259	2,193	2,034	2,263	2,061	1,967
CeVD	3,149	3,078	3,025	2,492	2,067	1,796	2,148	1,832	1,766
Pneumonia	1,644	1,602	1,540	1,409	1,344	1,314	1,429	1,329	1,257
Influenza	487	483	455	418	393	395	418	391	388
Acute bronchitis	522	521	509	489	484	460	559	470	469
COPD	1,291	1,276	1,216	1,101	1,134	1,104	1,173	1,117	995
Resp. failure	844	806	784	732	786	721	823	729	658

\* Age not included as covariate in these regression models in order to prevent overfitting.

All models adjusted for age (unless stated otherwise), sex, type of admission, and center.

“Queralt Dx” includes principal diagnosis, pre-existing comorbidities, and in-hospital complications; “Queralt DxS” includes pre-existing comorbidities.

Abbreviations: AMI = acute myocardial infarction; APRDRG = All Patients Refined Diagnosis Related Groups; CeVD = cerebrovascular disease; COPD = chronic obstructive pulmonary disease; HF = heart failure.

**Supplementary Table S2.** In-hospital death: Bayesian Information Criterion.

	<b>Basic Model</b>	<b>Charlson</b>	<b>Elixhauer</b>	<b>Queralt DxS</b>	<b>APRDRG Risk</b>	<b>APRDRG Severity</b>	<b>APRDRG Risk*</b>	<b>APRDRG Severity*</b>	<b>Queralt Dx</b>
All	49,592	46,926	44,749	37,895	37,007	33,924	39,203	34,291	30,757
Colon cancer	560	518	484	457	483	419	453	391	416
Pancreatic cancer	531	490	475	389	444	412	416	384	367
Lung cancer	1,246	1,197	1,181	1,046	1,125	1,049	1,086	1,017	970
Leukemia	472	473	469	393	435	411	418	374	368
AMI	1,580	1,572	1,440	1,247	1,054	1,048	1,054	1,023	991
Arrhythmia	438	436	436	380	349	346	283	279	350
HF	2,792	2,783	2,693	2,389	2,337	2,178	2,347	2,145	2,110
CeVD	3,266	3,200	3,147	2,615	2,202	1,931	2,227	1,912	1,901
Pneumonia	1,759	1,722	1,660	1,530	1,477	1,447	1,508	1,408	1,390
Influenza	584	584	556	519	504	507	484	457	499
Acute bronchitis	637	640	629	610	618	593	638	549	602
COPD	1,401	1,393	1,333	1,218	1,262	1,233	1,253	1,197	1,124
Resp. failure	932	899	877	825	888	823	883	789	760

\* Age not included as covariate in these regression models in order to prevent overfitting.

All models adjusted for age (unless stated otherwise), sex, type of admission, and center.

“Queralt Dx” includes principal diagnosis, pre-existing comorbidities, and in-hospital complications; “Queralt DxS” includes pre-existing comorbidities.

Abbreviations: AMI = acute myocardial infarction; APRDRG = All Patients Refined Diagnosis Related Groups; CeVD = cerebrovascular disease; COPD = chronic obstructive pulmonary disease; HF = heart failure.

**Supplementary Table S3.** In-hospital death: Brier’s score.

	<b>Basic Model</b>	<b>Charlson</b>	<b>Elixhauer</b>	<b>Queralt DxS</b>	<b>APRDRG Risk</b>	<b>APRDRG Severity</b>	<b>APRDRG Risk*</b>	<b>APRDRG Severity*</b>	<b>Queralt Dx</b>
All	0.0397	0.0423	0.0411	0.0324	0.0322	0.0299	0.0335	0.0302	0.0271
Colon cancer	0.0628	0.0578	0.0548	0.0472	0.0507	0.0419	0.0515	0.0434	0.0417
Pancreatic cancer	0.1215	0.1125	0.1078	0.0788	0.0891	0.0814	0.0914	0.0836	0.0690
Lung cancer	0.1298	0.1266	0.1245	0.1053	0.1149	0.1046	0.1166	0.1072	0.0951
Leukemia	0.1278	0.1304	0.1286	0.0944	0.1089	0.0968	0.1163	0.0993	0.0833
AMI	0.0643	0.0642	0.0606	0.0514	0.0456	0.0449	0.0472	0.0460	0.0400
Arrhythmia	0.0116	0.0123	0.0123	0.0098	0.0088	0.0084	0.0091	0.0087	0.0086
HF	0.0706	0.0704	0.0686	0.0606	0.0609	0.0564	0.0623	0.0579	0.0530
CeVD	0.1439	0.1423	0.1393	0.1101	0.0888	0.0747	0.0927	0.0770	0.0752
Pneumonia	0.0705	0.0717	0.0692	0.0619	0.0604	0.0596	0.0638	0.0604	0.0551
Influenza	0.0509	0.0516	0.0497	0.0440	0.0414	0.0419	0.0441	0.0421	0.0396
Acute bronchitis	0.0180	0.0195	0.0193	0.0176	0.0174	0.0168	0.0183	0.0172	0.0165
COPD	0.0448	0.0446	0.0434	0.0392	0.0410	0.0405	0.0424	0.0413	0.0357
Resp. failure	0.1766	0.1678	0.1619	0.1456	0.1586	0.1428	0.1694	0.1488	0.1274

\* Age not included as covariate in these regression models in order to prevent overfitting.

All models adjusted for age (unless stated otherwise), sex, type of admission, and center.

“Queralt Dx” includes principal diagnosis, pre-existing comorbidities, and in-hospital complications; “Queralt DxS” includes pre-existing comorbidities.

Abbreviations: AMI = acute myocardial infarction; APRDRG = All Patients Refined Diagnosis Related Groups; CeVD = cerebrovascular disease; COPD = chronic obstructive pulmonary disease; HF = heart failure.

**Supplementary Table S4.** Length of in-hospital stay >14 days: Akaike’s Information Criterion.

	<b>Basic Model</b>	<b>Charlson</b>	<b>Elixhauer</b>	<b>Queralt DxS</b>	<b>APRDRG Risk</b>	<b>APRDRG Severity</b>	<b>APRDRG Risk*</b>	<b>APRDRG Severity*</b>	<b>Queralt Dx</b>
All	80,008	77,084	76,131	75,772	70,305	74,039	71,089	75,127	69,762
Colon cancer	755	751	744	745	649	712	644	705	654
Pancreatic cancer	554	545	548	551	537	549	530	540	548
Lung cancer	987	980	982	981	944	970	934	959	940
Leukemia	563	540	536	564	482	542	530	602	445
AMI	1,827	1,798	1,739	1,700	1,551	1,592	1,560	1,607	1,549
Arrhythmia	611	596	583	576	563	550	559	551	502
HF	3,118	3,112	3,059	3,003	2,813	2,930	2,834	2,982	2,744
CeVD	2,180	2,153	2,131	2,134	2,037	2,076	2,106	2,176	2,012
Pneumonia	1,722	1,697	1,659	1,575	1,469	1,562	1,484	1,579	1,453
Influenza	580	570	573	524	488	517	507	540	476
Acute bronchitis	732	719	705	667	679	696	709	705	643
COPD	1,745	1,743	1,683	1,619	1,559	1,625	1,550	1,623	1,475
Resp. failure	586	586	584	579	558	575	547	570	566

\* Age not included as covariate in these regression models in order to prevent overfitting.

All models adjusted for age (unless stated otherwise), sex, type of admission, and center.

“Queralt Dx” includes principal diagnosis, pre-existing comorbidities, and in-hospital complications; “Queralt DxS” includes pre-existing comorbidities.

Abbreviations: AMI = acute myocardial infarction; APRDRG = All Patients Refined Diagnosis Related Groups; CeVD = cerebrovascular disease; COPD = chronic obstructive pulmonary disease; HF = heart failure.

**Supplementary Table S5.** Length of in-hospital stay >14 days: Bayesian Information Criterion.

	<b>Basic Model</b>	<b>Charlson</b>	<b>Elixhauer</b>	<b>Queralt DxS</b>	<b>APRDRG Risk</b>	<b>APRDRG Severity</b>	<b>APRDRG Risk*</b>	<b>APRDRG Severity*</b>	<b>Queralt Dx</b>
All	80,197	77,282	76,329	75,971	70,534	74,268	71,229	75,267	69,981
Colon cancer	829	830	822	824	738	801	708	769	743
Pancreatic cancer	619	614	617	620	615	627	586	597	626
Lung cancer	1,075	1,074	1,076	1,075	1,049	1,074	1,002	1,027	1,044
Leukemia	637	617	614	642	568	628	583	656	531
AMI	1,923	1,900	1,841	1,802	1,665	1,706	1,638	1,685	1,663
Arrhythmia	722	711	698	692	692	679	635	627	630
HF	3,242	3,242	3,189	3,133	2,956	3,073	2,919	3,066	2,887
CeVD	2,296	2,276	2,253	2,257	2,171	2,211	2,186	2,256	2,147
Pneumonia	1,837	1,817	1,780	1,696	1,602	1,695	1,562	1,658	1,586
Influenza	676	671	674	625	600	628	573	606	587
Acute bronchitis	847	838	825	788	812	829	787	784	776
COPD	1,856	1,859	1,799	1,736	1,688	1,754	1,630	1,703	1,604
Resp. failure	675	679	677	671	660	677	608	630	669

\* Age not included as covariate in these regression models in order to prevent overfitting.

All models adjusted for age (unless stated otherwise), sex, type of admission, and center.

“Queralt Dx” includes principal diagnosis, pre-existing comorbidities, and in-hospital complications; “Queralt DxS” includes pre-existing comorbidities.

Abbreviations: AMI = acute myocardial infarction; APRDRG = All Patients Refined Diagnosis Related Groups; CeVD = cerebrovascular disease; COPD = chronic obstructive pulmonary disease; HF = heart failure.

**Supplementary Table S6.** Length of in-hospital stay >14 days: Brier’s score.

	<b>Basic Model</b>	<b>Charlson</b>	<b>Elixhauer</b>	<b>Queralt DxS</b>	<b>APRDRG Risk</b>	<b>APRDRG Severity</b>	<b>APRDRG Risk*</b>	<b>APRDRG Severity*</b>	<b>Queralt Dx</b>
All	0.0679	0.0724	0.0718	0.0658	0.0615	0.0639	0.0620	0.0647	0.0609
Colon cancer	0.1036	0.1055	0.1046	0.1022	0.0891	0.0970	0.0900	0.0974	0.0887
Pancreatic cancer	0.1522	0.1520	0.1524	0.1513	0.1448	0.1489	0.1455	0.1493	0.1495
Lung cancer	0.1032	0.1039	0.1044	0.1028	0.0998	0.1020	0.1002	0.1023	0.0993
Leukemia	0.2023	0.1969	0.1957	0.2017	0.1606	0.1887	0.1894	0.2257	0.1426
AMI	0.0850	0.0843	0.0816	0.0804	0.0742	0.0764	0.0748	0.0775	0.0736
Arrhythmia	0.0274	0.0286	0.0283	0.0274	0.0266	0.0260	0.0269	0.0264	0.0241
HF	0.0866	0.0866	0.0856	0.0848	0.0791	0.0819	0.0802	0.0840	0.0767
CeVD	0.0906	0.0905	0.0898	0.0895	0.0852	0.0862	0.0896	0.0917	0.0848
Pneumonia	0.0721	0.0739	0.0726	0.0681	0.0632	0.0673	0.0642	0.0684	0.0620
Influenza	0.0616	0.0623	0.0619	0.0564	0.0519	0.0546	0.0550	0.0589	0.0501
Acute bronchitis	0.0251	0.0269	0.0266	0.0241	0.0243	0.0244	0.0248	0.0246	0.0234
COPD	0.0657	0.0657	0.0641	0.0626	0.0586	0.0619	0.0589	0.0626	0.0562
Resp. failure	0.1046	0.1058	0.1056	0.1033	0.0987	0.1016	0.0999	0.1039	0.1009

\* Age not included as covariate in these regression models in order to prevent overfitting.

All models adjusted for age (unless stated otherwise), sex, type of admission, and center.

“Queralt Dx” includes principal diagnosis, pre-existing comorbidities, and in-hospital complications; “Queralt DxS” includes pre-existing comorbidities.

Abbreviations: AMI = acute myocardial infarction; APRDRG = All Patients Refined Diagnosis Related Groups; CeVD = cerebrovascular disease; COPD = chronic obstructive pulmonary disease; HF = heart failure.



**Supplementary Table S7.** ICU stay: Akaike’s Information Criterion.

	<b>Basic Model</b>	<b>Charlson</b>	<b>Elixhauer</b>	<b>Queralt DxS</b>	<b>APRDRG Risk</b>	<b>APRDRG Severity</b>	<b>APRDRG Risk*</b>	<b>APRDRG Severity*</b>	<b>Queralt Dx</b>
All	59,631	56,670	56,097	55,348	52,203	52,415	53,970	55,151	50,435
Colon cancer	333	327	326	326	308	306	304	303	309
Pancreatic cancer	136	128	131	136	119	116	127	123	126
Lung cancer	534	528	527	536	491	508	488	509	496
Leukemia	194	192	189	162	161	149	164	165	141
AMI	1,962	1,961	1,960	1,959	1,921	1,923	1,928	1,926	1,887
Arrhythmia	731	681	676	656	608	581	611	595	568
HF	1,150	1,147	1,142	1,096	985	1,009	1,064	1,114	966
CeVD	2,349	2,334	2,328	2,198	1,978	1,932	2,149	2,135	1,817
Pneumonia	1,166	1,158	1,094	976	803	854	872	971	757
Influenza	441	441	432	361	308	318	345	382	296
Acute bronchitis	529	511	487	473	507	507	564	572	470
COPD	620	621	603	553	472	521	474	539	438
Resp. failure	581	567	572	534	434	486	449	538	480

\* Age not included as covariate in these regression models in order to prevent overfitting.

All models adjusted for age (unless stated otherwise), sex, type of admission, and center.

“Queralt Dx” includes principal diagnosis, pre-existing comorbidities, and in-hospital complications; “Queralt DxS” includes pre-existing comorbidities.

Abbreviations: AMI = acute myocardial infarction; APRDRG = All Patients Refined Diagnosis Related Groups; CeVD = cerebrovascular disease; COPD = chronic obstructive pulmonary disease; HF = heart failure; ICU = intensive care unit.

**Supplementary Table S8.** ICU stay: Bayesian Information Criterion.

	<b>Basic Model</b>	<b>Charlson</b>	<b>Elixhauer</b>	<b>Queralt DxS</b>	<b>APRDRG Risk</b>	<b>APRDRG Severity</b>	<b>APRDRG Risk*</b>	<b>APRDRG Severity*</b>	<b>Queralt Dx</b>
All	59,820	56,868	56,294	55,548	52,432	52,644	54,110	55,291	50,654
Colon cancer	407	406	404	405	397	395	368	367	398
Pancreatic cancer	200	197	200	205	197	194	183	179	203
Lung cancer	623	621	621	630	596	612	556	577	601
Leukemia	268	269	267	240	247	235	218	218	227
AMI	2,059	2,063	2,062	2,061	2,035	2,037	2,006	2,004	2,002
Arrhythmia	842	796	792	772	736	710	687	671	696
HF	1,274	1,277	1,273	1,226	1,128	1,152	1,148	1,199	1,110
CeVD	2,466	2,456	2,451	2,320	2,113	2,066	2,228	2,215	1,952
Pneumonia	1,281	1,279	1,215	1,097	936	987	950	1,050	890
Influenza	537	542	533	462	420	430	411	448	408
Acute bronchitis	644	630	606	594	640	640	643	651	603
COPD	730	738	719	669	601	650	553	619	567
Resp. failure	669	660	664	627	537	589	510	598	582

\* Age not included as covariate in these regression models in order to prevent overfitting.

All models adjusted for age (unless stated otherwise), sex, type of admission, and center.

“Queralt Dx” includes principal diagnosis, pre-existing comorbidities, and in-hospital complications; “Queralt DxS” includes pre-existing comorbidities.

Abbreviations: AMI = acute myocardial infarction; APRDRG = All Patients Refined Diagnosis Related Groups; CeVD = cerebrovascular disease; COPD = chronic obstructive pulmonary disease; HF = heart failure; ICU = intensive care unit.

**Supplementary Table S9.** ICU stay: Brier’s score.

	<b>Basic Model</b>	<b>Charlson</b>	<b>Elixhauer</b>	<b>Queralt DxS</b>	<b>APRDRG Risk</b>	<b>APRDRG Severity</b>	<b>APRDRG Risk*</b>	<b>APRDRG Severity*</b>	<b>Queralt Dx</b>
All	0.0484	0.0507	0.0505	0.0457	0.0439	0.0440	0.0447	0.0453	0.0424
Colon cancer	0.0399	0.0398	0.0395	0.0384	0.0372	0.0370	0.0375	0.0378	0.0384
Pancreatic cancer	0.0257	0.0221	0.0236	0.0242	0.0213	0.0197	0.0259	0.0232	0.0215
Lung cancer	0.0503	0.0498	0.0497	0.0503	0.0467	0.0469	0.0484	0.0489	0.0468
Leukemia	0.0501	0.0510	0.0507	0.0376	0.0377	0.0337	0.0421	0.0406	0.0303
AMI	0.0941	0.0942	0.0942	0.0941	0.0934	0.0930	0.0943	0.0936	0.0916
Arrhythmia	0.0361	0.0366	0.0366	0.0332	0.0307	0.0301	0.0316	0.0312	0.0291
HF	0.0265	0.0263	0.0262	0.0256	0.0240	0.0246	0.0254	0.0264	0.0240
CeVD	0.1027	0.1030	0.1029	0.0971	0.0869	0.0841	0.0967	0.0955	0.0785
Pneumonia	0.0458	0.0472	0.0451	0.0394	0.0343	0.0357	0.0372	0.0408	0.0298
Influenza	0.0465	0.0473	0.0459	0.0383	0.0297	0.0303	0.0347	0.0395	0.0305
Acute bronchitis	0.0192	0.0203	0.0200	0.0173	0.0190	0.0190	0.0204	0.0203	0.0172
COPD	0.0188	0.0188	0.0186	0.0173	0.0149	0.0173	0.0154	0.0179	0.0139
Resp. failure	0.1090	0.1073	0.1080	0.0959	0.0766	0.0855	0.0808	0.0980	0.0834

\* Age not included as covariate in these regression models in order to prevent overfitting.

All models adjusted for age (unless stated otherwise), sex, type of admission, and center.

“Queralt Dx” includes principal diagnosis, pre-existing comorbidities, and in-hospital complications; “Queralt DxS” includes pre-existing comorbidities.

Abbreviations: AMI = acute myocardial infarction; APRDRG = All Patients Refined Diagnosis Related Groups; CeVD = cerebrovascular disease; COPD = chronic obstructive pulmonary disease; HF = heart failure; ICU = intensive care unit.

**Supplementary Table S10.** Subgroup analyses by age and type of hospitalization, and sensitivity analysis excluding delivery-related hospitalizations.

	Basic	Charlson	Elixhauser	Queralt DxS	Queralt Dx	APR-DRG Risk	APR-DRG severity
0 – 29 years	0.764	0.785	0.820	0.937	0.985	0.964	0.951
60+ years	0.679	0.726	0.773	0.856	0.925	0.896	0.873
60+, Unplanned	0.592	0.658	0.717	0.817	0.898	0.867	0.840
60+, Planned	0.656	0.776	0.838	0.896	0.973	0.934	0.913
Excluding deliveries	0.753	0.785	0.822	0.897	0.944	0.923	0.904
<b>Overall</b>	<b>0.770</b>	<b>0.800</b>	<b>0.834</b>	<b>0.905</b>	<b>0.949</b>	<b>0.928</b>	<b>0.910</b>

Results presented as AUC. All models adjusted for age, sex, type of admission, and center.

“Queralt Dx” includes principal diagnosis, pre-existing comorbidities, and in-hospital complications; “Queralt DxS” includes pre-existing comorbidities.

Abbreviations: APR-DRG = All Patients Refined Diagnosis Related Groups; AUC = area under the curve