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Original research

Hospital Length of Stay Is Associated With Increased Likelihood for Venous Thromboembolism After Total Joint Arthroplasty

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ABSTRACT

Background: The prevalence of venous thromboembolism (VTE) after total joint arthroplasty (TJA) is 0.40%-1.2%. Trends in TJA are for shorter hospital stays with lower complication rates. The aim of this study is to evaluate whether hospital length of stay (LOS) is associated with risk of a thromboembolic event after TJA.

Methods: This was a retrospective study of patients undergoing TJA during 2013-2017 at Louisiana and Texas hospitals. Univariable analyses and multivariable logistic regression examined patient characteristics (sex, race, age, body mass index, Charlson Comorbidity Index, TJA type, and LOS) associated with experiencing a VTE event after discharge and before 1-year follow-up.

Results: Of the 13,969 patients who met inclusion criteria, 338 (2.4%) had a VTE event after discharge. In multivariable regression analysis, more severe comorbidities (odds ratio: 1.30, 95% confidence interval: 1.23-1.37; $P < .001$) and LOS days (odds ratio: 1.07, 95% confidence interval: 1.01 to 1.14; $P = .0215$) were associated with an increased risk of VTE.

Conclusion: Patients with more severe comorbidities or a longer LOS had a greater risk of VTE after discharge following TJA.

Introduction

Venous thromboembolism (VTE), which includes deep vein thrombosis (DVT) and pulmonary embolism (PE), is a well-recognized complication of total joint arthroplasty (TJA) that may result in longer hospital length of stay (LOS), higher rates of recurrent VTE and hospital readmission, increased medical costs, and greater mortality [1,2]. The prevalence of VTE during the first 2 months after TJA is 0.4%-1.2% when VTE prophylaxis is universally received [3-5]. Risk factors for VTE after TJA include older age, obesity, previous thrombosis, surgery, hospitalization, immobility, increased estrogen, and trauma [4-11]. The annual volumes of primary total hip arthroplasty (THA) and primary total knee arthroplasty (TKA) procedures are expected to increase from 2014 to 2030 by, respectively, 71% (635,000) and 85% (1.26 million) in the United States [12]. This projected increase in TJA volume, which will likely include more elderly patients and patients with comorbidities, raises concerns about complications and costs due to longer hospitalizations.

Patients with longer hospital LOS have an increased risk for medical complications and functional decline which, in turn, may increase the risk of VTE [4,8,11,13]. Xu et al. [4] found that advanced age and TKA compared with THA were risk factors for postoperative DVT after TJA. A retrospective study examining risk factors for VTE after total shoulder arthroplasty found that African American race and increased LOS increased risk of VTE. A retrospective study of 106,598 patients identified in the American College of Surgeons National Surgical Quality Improvement Program database who underwent TKA (n = 64,513) or THA (n = 42,085) during 2011-2013

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found that longer LOS was statistically significantly associated with higher rates of 30-day complications, including DVT and PE [11]. Patients with the longest LOS (≥4 days) were significantly older, had longer operative times, and had more comorbidities than patients with shorter hospital stays. Multivariable logistic regression analyses showed that the likelihood of having a 30-day complication was 1.5 times (odds ratio [OR]: 1.5, 95% confidence interval [CI]: 1.1-2.0) and 3.3 times (OR: 3.3, 95% CI: 2.5-4.5) higher for THA patients discharged on day 3 and day ≥4, respectively, than THA patients discharged on day 1 and 3 times higher for TKA patients discharged on day ≥4 vs day 1 (OR: 3.0, 95% CI: 2.1-4.5).

The aim of this study is to evaluate whether hospital LOS is associated with the risk of VTE after hospital discharge in TJA patients who did not have a medical complication (indicated in Supplemental Table 1) during index stay. We hypothesize that increasing LOS will be associated with an increased risk of VTE after discharge in these otherwise healthy patients. We hope to add to the body of literature that rapid recovery protocols decrease complications and analyze factors that may contribute to increase in risk of VTE after TJA.

Material and methods

Patient selection and measures

We obtained a data set from the Research Action for Health Network (REACHnet) containing demographic and clinical information on patients who received a primary TKA or THA during 2013-2017 at one of the following hospitals or hospital systems in Louisiana and Texas: Ochsner Health System, Tulane University, Baylor Scott & White Health. Eligible patients were of black or white race (due to small numbers of patients self-identifying as being of other than black or white race) and had a body mass index (BMI) of ≥20 mg/kg^2 recorded within 1 year of surgery. The data set included patient demographics, ICD-9 and ICD-10 codes, CPT codes, and laboratory data. The study was approved by the institutional review board at LSU Health Sciences Center.

VTE was defined as the occurrence of DVT in the upper extremity or lower extremity or PE during the period after hospital discharge and before 1 year after TJA, as indicated by codes shown in Supplemental Table 1. We excluded patients with VTEs that occurred during the index hospitalization as these may have been attributable to intraoperative or surgical factors and other complications during index stay such as urinary tract infection, pneumonia, and so on (codes shown in Supplemental Table 1). Patients with LOS ≥8 days were excluded from analysis as this may have indicated complications not included in the supplemental list of ICD codes. The goal of the proposed study was to examine post-discharge VTE risk factors in patients who did not have medical complications, including VTE, during their index postsurgical stay.

Statistical analysis

Data were analyzed using R statistical software version 4.0.2. Univariable analysis examined VTE status (yes vs no) by patient demographic and clinical characteristics. Chi-square tests and Wilcoxon rank sum tests were used to compare categorical or continuous variables, respectively, between the VTE groups. Multivariable logistic regression analysis was performed to evaluate factors related to the likelihood of experiencing a VTE. Variables entered into the model included race, sex, age, type of surgery (TKA vs THA), BMI, LOS, and the Charlson Comorbidity Index (CCI). LOS was examined as a continuous variable. The CCI was modified to exclude age so that the effects of age and comorbidities could be assessed separately. P values < .05 were considered statistically significant.

Results

Table 1 describes the characteristics for the overall sample (n = 13,969) and by VTE status. The overall sample was predominately female (59.4%) and of white race (81.3%). The mean age was 65.9 years (range: 18-103). Most surgeries (66.2%) were knee replacements. Most patients were overweight with 45.4% classified as obese and 12.9% as morbidly obese. The mean (standard deviation) LOS was 1.76 (1.66).

Of the 13,969 patients, 338 (2.4%) had a VTE after discharge and within 1 year after surgery. Patients who experienced a VTE were older (P = .004) and had more severe comorbidities (P < .001) than those who did not experience a VTE. Figure 1 shows the percentage of patients who experienced a VTE by LOS. Figure 1 also includes the simple linear regression line predicting VTE% based on continuous LOS. The prevalence of VTE was 1.8%-2.6% among patients with a LOS of 0-3 days and 2.9%-5.3% among patients with an LOS of 4-7 days. Of the 338 VTEs, 25.5% occurred within 1 week of discharge, 20.4% between 1 week and 3 weeks after discharge, and 54.1% more than 3 weeks after discharge. Figure 2 is a forest plot displaying the multivariable regression results. Statistically significant predictors of an increased likelihood of developing VTE were more severe comorbidities (OR: 1.30, 95% CI: 1.23-1.38, P < .001) and increased LOS (OR: 1.07, 95% CI: 1.01 to 1.14; P = .0215).

Discussion

In this large retrospective study of 13,969 TJA patients treated in Louisiana and Texas, the strongest independent predictors of a VTE after discharge were increased severity of comorbidities and increased LOS. Our findings are consistent with those of Otero et al. [11] who found that increased LOS was associated with a higher prevalence of 30-day complications, including PE and DVT, among THA patients with a LOS ≥3 days. This study is the only other study that directly examines the effects of LOS on complications. Xu et al. [4] found similar findings of increased DVT with delayed ambulation postoperatively which increase LOS. A very large retrospective study examined complications after TJA and found decreased complications including VTE with LOS less than or equal to 5 days.

Table 1
Patient characteristics for overall sample and by VTE status.

Demographic variables	All patients (n = 13,969)	No VTE (n = 13,631)	VTE (n = 338)	P value[a]
Age, mean (SD), y	65.85 (10.8)	65.81 (10.78)	67.31 (11.44)	.004
Sex, n (%)				.324
Male	5674 (40.6)	5546 (40.7)	128 (37.9)	
Female	8295 (59.4)	8085 (59.3)	210 (62.1)	
Race, n (%)				.243
Black	2613 (18.7)	2541 (18.6)	72 (21.3)	
White	11356 (81.3)	11090 (81.4)	266 (78.7)	
BMI, n (%)				.164
<30 kg/m^2	5821 (41.7)	5689 (41.7)	132 (39.1)	
30-40 kg/m^2	6343 (45.4)	6192 (45.4)	151 (44.7)	
≥40 kg/m^2	1805 (12.9)	1750 (12.8)	55 (16.3)	
Type of surgery, n (%)				.067
THA	4720 (33.8)	4622 (33.9)	98 (29)	
TKA	9249 (66.2)	9009 (66.1)	240 (71)	
CCI, mean (SD)	0.92 (1.4)	0.9 (1.38)	1.67 (2.02)	<.001
Length of stay, mean (SD)	1.76 (1.66)	1.75 (1.66)	1.93 (1.85)	.134

BMI, body mass index; CCI, Charlson Comorbidity Index; SD, standard deviation; THA, total hip arthroplasty; TKA, total knee arthroplasty; VTE, venous thromboembolism.

[a] P value is for comparison of no VTE and VTE groups.

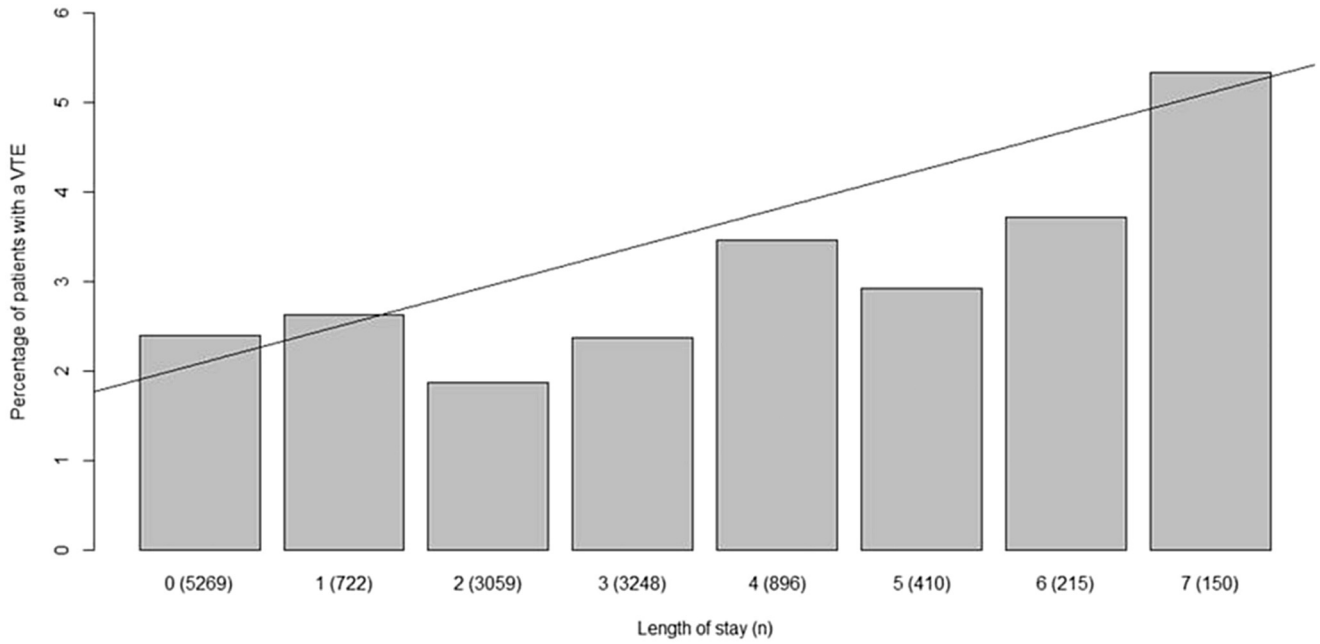

Figure 1. Proportion of patients who experienced a venous thromboembolism (VTE) by length of stay. The line shown is the resulting linear regression predicting VTE percentage as a function of continuous length of stay.

With an increasing number of procedures and an aging population with more comorbidities, it is important to keep in mind risk factors for complications such as VTE that can prove costly [2,4-12]. Rapid recovery protocols and outpatient TJA are occurring more regularly, and literature has not reported increased complications [5,7,11]. Our study adds to the body of literature showing the

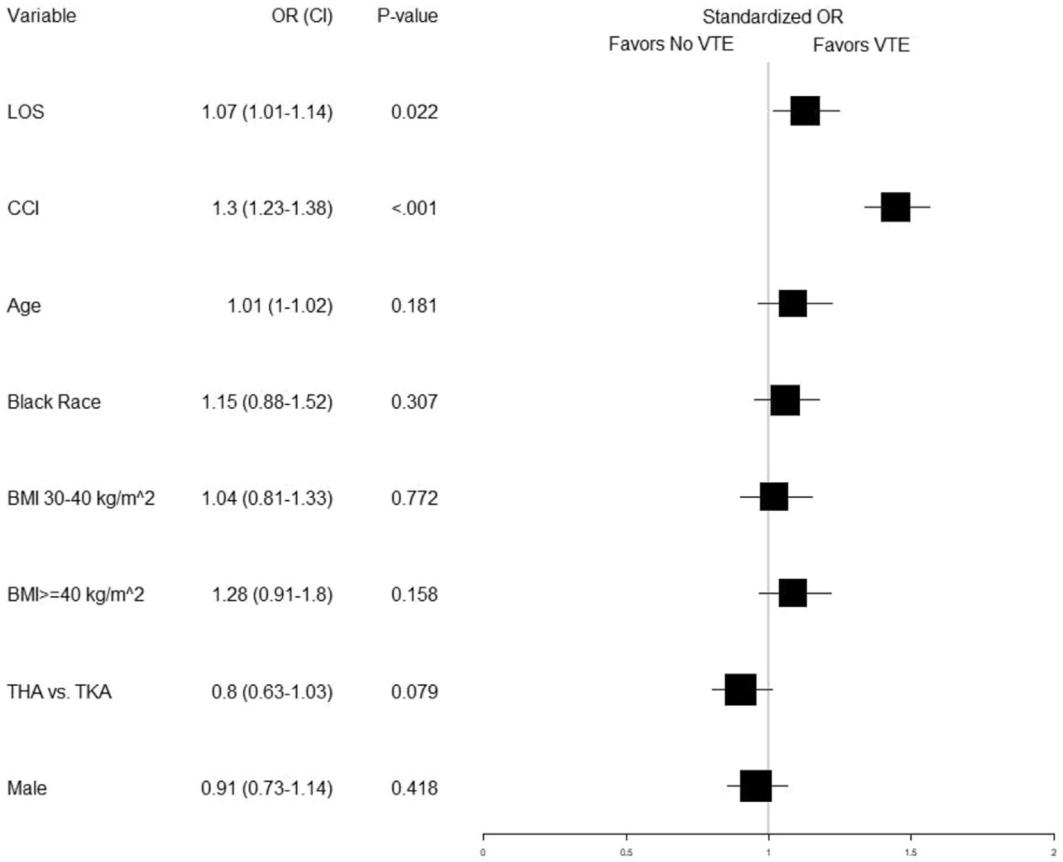

Figure 2. Forest plot for logistic regression of VTE. Bars indicate 95% confidence intervals for standardized predictors. Variables were standardized so that confidence interval magnitudes were directly comparable. Raw values for the odds ratios and confidence intervals are listed in the table. Reported values for the row "THA vs TKA" should be interpreted as the odds ratio of VTE for patients with THA compared to those with TKA.

potential beneficial effects of rapid recovery protocols and a lower risk of VTE. Although this study only demonstrated an association and not causality, policies such as the CMS 2 midnight rule may unnecessarily place patients at increased risk of unintended surgical complications such as VTE.

A systematic review of 54 studies that evaluated risk factors for VTE after TJA found consistent evidence that older age, female sex, and higher BMI were VTE risk factors for both TKA and THA [14]. Although our univariable analyses showed that older age and more severe comorbidities were statistically significant predictors of VTE after TJA, only comorbidities remained a statistically significant predictor of VTE in the multivariable analysis. Increased age and BMI were not statistically significant predictors of VTE which is surprising and contradicts previous studies [4,5,14]. CCI remained a significant predictor which is in accordance with both the study by Zhang et al. and Zoller et al. who found increased CCI and age in their VTE cohorts [15,16]. Zhang et al. showed that CCI >2 increased mortality, and Zoller et al. showed increased mortality with increasing CCI [15,16]. These studies show how CCI affects the disease burden. Lakomkin et al. [17] examined the effects of CCI on LOS in the orthopedic hip trauma population and found increasing LOS with increasing CCI. To our knowledge, no study directly examined the effects of CCI in patients undergoing TJA. We found an increased risk of VTE with increased CCI, which may provide a good screening tool for patients at risk for increased LOS and VTE.

This study had several limitations. The database lacked complete VTE prophylaxis data as only prescription prophylaxis medication was captured. We do not know how VTE prophylaxis such as over-the-counter aspirin use affected our cohort, but it is common practice that all patients undergoing TJA receive some form of VTE prophylaxis. There is potential to analyze the effects of more potent VTE prophylaxis after TJA in patients with increased CCI. Another limitation was that the reasons for increased LOS were unknown; however, patients with known complications during the index stay were excluded. The study sample was specific to patients treated in Louisiana and Texas and thus may not be broadly representative. Although the sample was relatively large, the rarity of VTE limited the study's power to examine risk of VTE among patient subgroups. Future studies of VTE risk after TJA should use very large patient data sets to explore the relationship between LOS and VTE while controlling for multiple patient demographic and clinical variables.

Conclusions

We found that more severe comorbidity and increased LOS were associated with an increased risk of VTE in TJA patients in multivariable analysis. Shorter hospital stays should decrease costs for the patient and the hospital and may improve patient safety by reducing the risk of complications [2-12].

Declaration of interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this article.

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These contributions included data from their respective facilities for the project. In addition, each contributed to reviewing/editing the final manuscript.

References

[1] Geerts WH, Bergqvist D, Pineo GF, et al. Prevention of venous thromboembolism: American College of chest physicians evidence-based clinical practice Guidelines (8th edition). Chest 2008;133(6 Suppl):381S.
[2] Spyropoulos AC, Lin J. Direct medical costs of venous thromboembolism and subsequent hospital readmission rates: an administrative claims analysis from 30 managed care organizations. J Manag Care Pharm 2007;13(6):475.
[3] Warren JA, Sundaram K, Kamath AF, et al. Venous thromboembolism rates did not decrease in lower extremity revision total joint arthroplasty from 2008 to 2016. J Arthroplasty 2019;34(11):2774.
[4] Xu H, Zhang S, Xie J, et al. A nested case-control study on the risk factors of deep vein thrombosis for Chinese after total joint arthroplasty. J Orthop Surg Res 2019;14(1):188.
[5] Petersen PB, Kehlet H, Jørgensen CC, Lundbeck Foundation Centre for Fast-track Hip and Knee Replacement Collaborative Group. Safety of in-hospital only thromboprophylaxis after fast-track total hip and knee arthroplasty: a prospective follow-up study in 17,582 procedures. Thromb Haemost 2018;118(12):2152.
[6] Cushman M. Epidemiology and risk factors for venous thrombosis. Semin Hematol 2007;44(2):62.
[7] Courtney PM, Boniello AJ, Berger RA. Complications following outpatient total joint arthroplasty: an analysis of a national database. J Arthroplasty 2017;32(5):1426.
[8] Lung BE, Kanjiya S, Bisogno M, Komatsu DE, Wang ED. Risk factors for venous thromboembolism in total shoulder arthroplasty. JSES Open Access 2019;3(3):183.
[9] Shahi A, Bradbury TL, Guild 3rd GN, Saleh UH, Ghanem E, Oliashirazi A. What are the incidence and risk factors of in-hospital mortality after venous thromboembolism events in total hip and knee arthroplasty patients? Arthroplasty Today 2018;4(3):343.
[10] Kang J, Jiang X, Wu B. Analysis of risk factors for lower-limb deep venous thrombosis in Old patients after knee arthroplasty. Chin Med J 2015;128(10):1358.
[11] Otero JE, Gholson JJ, Pugely AJ, Gao Y, Bedard NA, Callaghan JJ. Length of hospitalization after joint arthroplasty: does early discharge affect complications and readmission rates? J Arthroplasty 2016;31(12):2714.
[12] Sloan M, Premkumar A, Sheth NP. Projected volume of primary total joint arthroplasty in the U.S., 2014 to 2030. J Bone Joint Surg Am 2018;100(17):1455.
[13] Hoyer EH, Friedman M, Lavezza A, et al. Promoting mobility and reducing length of stay in hospitalized general medicine patients: a quality-improvement project. J Hosp Med 2016;11(5):341.
[14] Zhang ZH, Shen B, Yang J, Zhou ZK, Kang PD, Pei FX. Risk factors for venous thromboembolism of total hip arthroplasty and total knee arthroplasty: a systematic review of evidences in ten years. BMC Musculoskelet Disord 2015;16:24.
[15] Zhang Z, Lei J, Shao X, et al., China Venous Thromboembolism Study Group. Trends in hospitalization and in-hospital mortality from vte, 2007 to 2016, in China. Chest 2019;155(2):342.
[16] Zöller B, Pirouzifard M, Sundquist J, Sundquist K. Association of short-term mortality of venous thromboembolism with family history of venous thromboembolism and Charlson comorbidity index. Thromb Haemost 2019;119(1):48.
[17] Lakomkin N, Kothari P, Dodd AC, et al. Higher Charlson comorbidity index Scores are associated with increased hospital length of stay after lower extremity orthopaedic trauma. J Orthop Trauma 2017;31(1):21.

Appendix

Table 1S
Procedural and diagnostic codes (ICD 10, ICD 9, CPT).

	ICD codes
Hip primary	0SR9019, 0SR901A, 0SR901Z, 0SR9029, 0SR902A, 0SR902Z, 0SR9039, 0SR903A, 0SR903Z, 0SR9049, 0SR904A, 0SR904Z, 0SR907Z, 0SR90J9, 0SR90JA, 0SR90JZ, 0SRA009, 0SRA00A, 0SRA019, 0SRA01A, 0SRA01Z, 0SRA03A, 0SRA03Z, 0SRA0J9, 0SRA0JA, 0SRA0JZ, 0SRB019, 0SRB01A, 0SRB01Z, 0SRB029, 0SRB02A, 0SRB02Z, 0SRB039, 0SRB03A, 0SRB03Z, 0SRB049, 0SRB04A, 0SRB04Z, 0SRB07Z, 0SRB0J9, 0SRB0JA, 0SRB0JZ, 0SRE009, 0SRE00Z, 0SRE019, 0SRE01Z, 0SRE0J9, 0SRE0JA, 0SRE0JZ, 0SRR019, 0SRR01A, 0SRR01Z, 0SRR039, 0SRR03A, 0SRR03Z, 0SRR0J9, 0SRR0JA, 0SRR0JZ, 0SRS019, 0SRS01A, 0SRS01Z, 0SRS039, 0SRS03A, 0SRS03Z, 0SRS0J9, 0SRS0JA, 0SRS0JZ, 27122, 27130, 27132, 81.51
Knee primary	0SRC07Z, 0SRC0J9, 0SRC0JA, 0SRC0JZ, 0SRD0J9, 0SRD0JA, 0SRD0JZ, 0SRT0J9, 0SRT0JZ, 0SRU0J9, 0SRU0JA, 0SRU0JZ, 0SRV0J9, 0SRV0JA, 0SRV0JZ, 0SRW0J9, 0SRW0JA, 0SRW0JZ, 27447, 81.54
Hip revisions	00.70, 00.71, 00.72, 1205, 1206, 1207, 1208, 1210, 1211, 1212, 1342, 1343, 1344, 1345, 1346, 1347, 1348, 1359, 1360, 1361, 1366, 1367, 1368, 1369, 1370, 1371, 1372, 1379, 2082, 2085, 2086, 2087, 4262
Knee revisions	00.8, 00.81, 00.82, 00.83, 1216, 1217, 1219, 1222, 1223, 1224, 1225, 1233, 1350, 1351, 1352, 1355, 1356, 1357, 1362, 1363, 1364, 1365, 1373, 1374, 1375, 1376, 1377, 1380, 1381, 2153, 2154, 2155, 2156, 2157, 2158, 2159, 2166, 2167, 2168, 4264
Complication codes	285.1, 998.11, , 998.12, 998.13, 459, 729.92, 998.5, 998.51, 998.3, 998.31, 998.32, 998.33, 287.4, 287.41, 287.5, 997.02, 480, 481, 482, 483, 484, 485, 486, 997.31, 997.32, 997.4, 997.5, 584, 584.5, 584.6, 584.7, 584.8, 584.9, 415.11, 415.13, 415.19, 451.11, 451.19, 451.2, 451.81, 453.4, 453.41, 453.42, 996.4, 996.41, 996.42, 996.43, 996.44, 996.45, 996.46, 996.47, 996.49, 996.66, 996.67, 996.77, 996.78, 999, 999.1, 999.2, 999.3, 999.4, 999.5, 999.6, 999.7, 999.8, 999.9, 719.56, 997.09, 997.2, 844.1, 599, V58.2, 99, 99.01, 99.03, 99.04, 99.05, 99.06, 99.07, D62, M96.810, M96.811, M96.30, M96.31, T88.8XXA, R58, M79.81, N/A, T81.30XA, T81.32XA, T81.31XA, T81.33XA, D69.59, D69.51, D69.6, I97.811, I97.821, J12.0, J12.1, J12.2, J12.81, J12.89, J12.9, J13, J18.1, J15.0, J15.1, J14, J15.4, J15.3, J15.20, J15.211, J15.212, J15.29, J15.8, J15.5, J15.6, A48.1, J15.9, J15.7, J16.0, J16.8, B25.0, A37.91, A22.1, B44.0, J17, J18.0, J18.9, J95.851, J95.89, K91.30, K91.31, K91.32, K91.81, K91.82, K91.83, K91.89, N99.89, N17.0, N17.1, N17.2, N17.8, N17.9, T80.0XXA, T81.718A, T81.72XA, I26.90, I26.92, I26.99, I80.10, I80.209, I80.3, I80.219, I82.409, I82.419, I82.429, I82.439, I82.4Y9, I82.449, I82.499, I82.4Z9, T84.498A, T84.039A, T84.029A, T84.019A, M97.9XXA, T84.059A, T84.069A, T84.099A, T84.119A, T84.129A, T84.199A, T84.50XA, T84.60XA, T84.7XXA, T84.81XA, T84.82XA, T84.83XA, T84.84XA, T84.85XA, T84.86XA, T84.89XA, T84.9XXA, T88.1XXA, T80.1XXA, T80.219A, T80.211A, T80.212A, T80.22XA, T80.29XA, T88.29XA, T80.51XA, T80.52XA, T80.59XA, T80.61XA, T80.62XA, T80.69XA, T80.30XA, T80.319A, T80.310A, T80.311A, T80.39XA, T80.40XA, T80.419A, T80.410A, T80.411A, T80.49XA, T80.A0XA, T80.A19A, T80.A10A, T80.A11A, T80.A9XA, T80.92XA, T80.810A, T80.818A, T80.919A, T80.910A, T80.911A, T80.89XA, T80.90XA, T88.9XXA, M25.669, M25.661, M25.662, G97.81, G97.82, T81.719A, S83.419A, N39.0, Z51.89, 30233H0, 30233N0, 30243H0, 30243N0, 30233H1, 30243H1, 30233N1, 30233P1, 30243N1, 30243P1, 30233R1, 30243R1, 30233T1, 30233V1, 30233W1, 30243T1, 30243V1, 30243W1, 30233J1, 30233K1, 30233L1, 30233M1, 30243J1, 30243K1, 30243L1, 30243M1
Hepatitis C	070.41, 070.44, 070.51, 070.70, 070.71, 070.54, B18.2
Liver conditions	571.2, 571.4, 571.5, 571.6, K70.0, K70.1, K70.2, K70.3, K70.9, K71.3, K71.5, K71.4, K71.7, K76.0, K76.2, K76.3, K76.4, K76.8, K76.9, Z94.4, 070.22, 070.23, 070.32, 070.33, 070.44, 070.54, 070.6, 070.9, 573.3, 573.4, 573.8, 573.9, V42.7, K73.0, K74.0, B18.0, 570.0, 571.0, K73.1, K74.1, B18.1, 570.1, 571.1, K73.2, K74.2, B18.2, 570.2, 571.2, K73.3, K74.3, B18.3, 570.3, 571.3, K73.4, K74.4, B18.4, 570.4, 571.4, K73.5, K74.5, B18.5, 570.5, 571.5, K73.6, K74.6, B18.6, 570.6, 571.6, K73.7, K74.7, B18.7, 570.7, 571.7, K73.8, K74.8, B18.8, 570.8, 571.8, K73.9, K74.9, B18.9, 570.9, 571.9, 456.0, 456.1, 456.2, 456.21, 572.2, 572.3, 572.4, 572.5, 572.6, 572.7, 572.8, I85.0, I85.9, I86.4, I98.2, K70.4, K71.1, K72.1, K72.9, K76.5, K76.6, K76.7, 070.41, 070.44, 070.51, 070.70, 070.71, 070.54, B18.2