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Research Report

The Future of Swiss Hospital Capacity Planning - New impulses from real-world evidence and stakeholder inputs

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The Future of Swiss Hospital Capacity Planning - New impulses from real-world evidence and stakeholder inputs

Research Report

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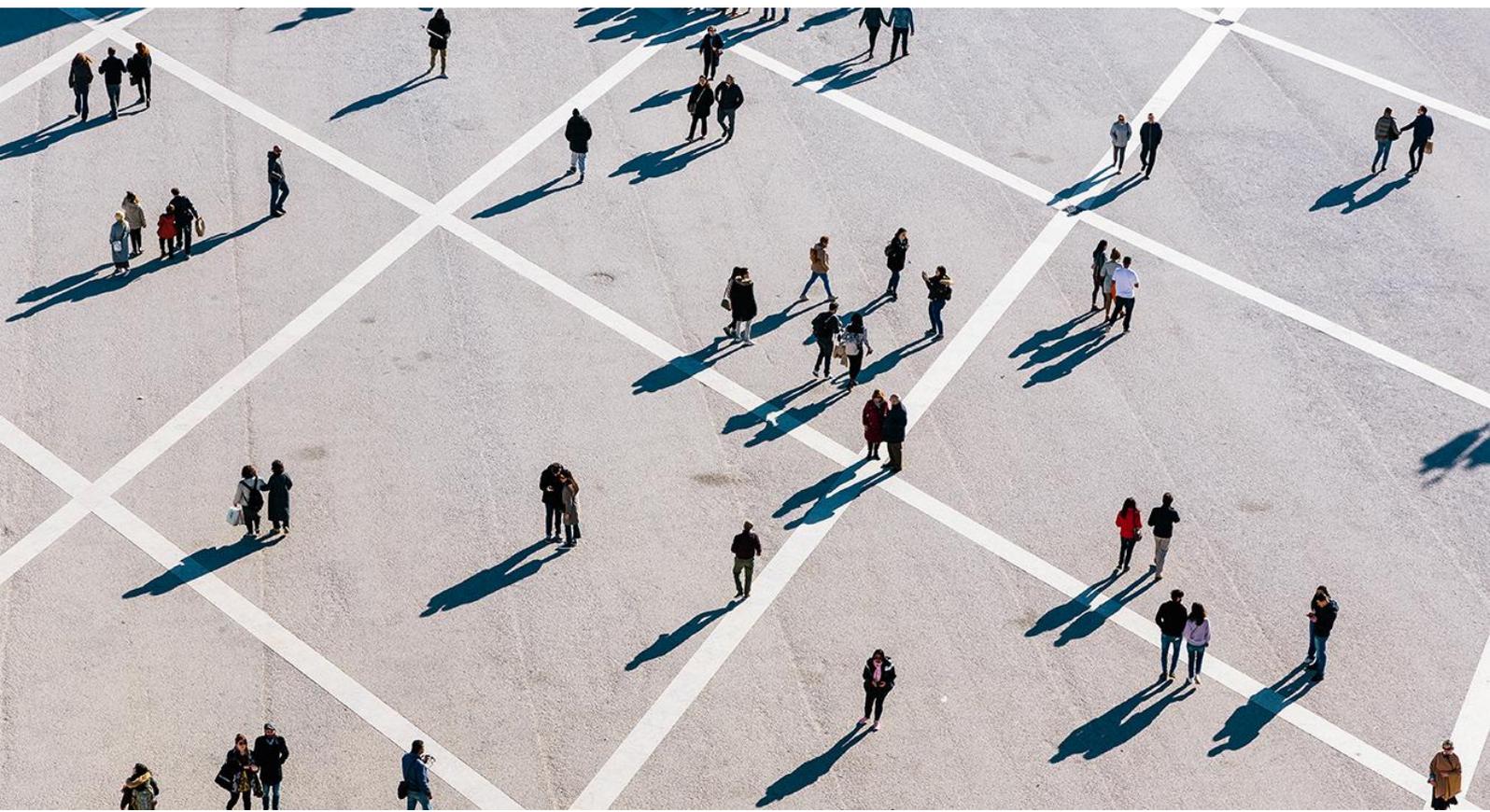
School of Medicine

The Future of Swiss Hospital Capacity Planning

New impulses from real-world evidence and stakeholder inputs

Dr. Justus Vogel, Enqi Fu, Charlotte Lang, Dr. David Ehlig, Prof. Dr. Alexander Geissler
University of St. Gallen | School of Medicine | Chair of Health Economics, Policy and Management

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Disclaimer

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Ethics and data availability statements

We utilize the Medical Statistics (“Medizinische Statistik”) from 2019 and 2022, provided by the Swiss Federal Statistics Office (FSO) and available upon request from the FSO. This dataset contains retrospective, de-identified, and anonymized administrative data. According to Swiss law, the study is therefore exempted from ethical approval and informed consent. Reference is made to the [Human Research Act, Article 2, paragraph 2, letter c](#) and [Human Research Ordinance, Article 25](#).

Conflict of interest

The content of the study was developed independently by the authors, i.e., freedom of research and teaching was maintained at all times. The study was financed by the Groupe Mutuel Foundation and the third-party funds thus made available were used for the intended purpose. Finally, it should be noted that the purpose of this scientific report is to communicate and illustrate the results obtained. Accordingly, we present the contents and arguments in a precise and concise manner.

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Summary

Background

Acute somatic hospital care accounts for a major share of Swiss healthcare expenditures. Reports of hospital deficits have increased in recent years, making them a major concern for health policy. These two factors raise questions about the adequacy of the hospital landscape and inpatient service provision, especially regarding the efficient utilization of human resources and infrastructure. Care planning is an important lever for efficient service provision. From 2012 onwards, all cantons have adopted Zurich's Hospital Capacity Planning Model (HCPM), which allocates service mandates to hospitals based on hospital planning service groups (SPLGs), complemented by national regulation on inter-cantonal planning of highly specialized medicine (IVHSM).

Despite these reforms, current planning still insufficiently reflects actual patient flows across cantons and does not integrate inpatient and outpatient need for care. This study provides empirical evidence and impulses to inform the future development of hospital – and more broadly – care planning in Switzerland. The research questions (RQs) are:

- (1) To what extent does current cantonal hospital planning align with real-world patient flows and service mandate utilization?
- (2) How should SPLGs be allocated to different regional planning levels, considering complexity and urgency?
- (3) What are health system stakeholders' priorities for care planning (e.g., inter-cantonal planning, inter-sectoral planning)?

Data and Methods

We use inpatient discharge data from the Swiss Federal Statistical Office's Medical Statistics. Our analysis focuses on 2022 (1.09 million cases), complemented with 2019 data (1.18 million cases) for selected analyses (pre-COVID-19 comparisons made available upon request). This study applies targeted analytical and methodological approaches aligned with each RQ. Regional analyses were conducted at canton or MedStat region level. There are roughly 700 MedStat regions, which are based on zip-codes and larger than zip-code areas but much smaller than cantons.

For RQ1, we visualize cross-cantonal patient flows, analyze travel times, and compare service provision with service mandates across selected SPLGs and neighboring cantons in Western Switzerland. For RQ2, we use k-means clustering to classify SPLGs by service complexity and urgency and link these clusters to appropriate planning authorities and regional planning levels. For RQ3, we draw on results from a stakeholder dialogue held in Bern on September 11, 2025, and provide an outlook discussing advances of recent care initiatives such as Réseau Bleu.



Results

RQ1: Cross-cantonal patient flows were analyzed for the selected SPLGs Basic Package (BP), Primary Knee Replacement (BEW7.2) and Cerebrovascular Disorders (NEU3). Many MedStat regions showed shares of out-of-canton care of more than 25 to 50 percent, and for some MedStat regions, out-of-canton service provision was close to 100%. Moreover, we find different cantonal outflow patterns depending on the SPLG. For instance, outflow for the BP is rather observed at MedStat regions close to cantonal borders, whereas for BEW7.2 outflows tend to be more independent of border vicinity and are influenced by the location of specialized orthopaedic centers. Travel time analyses for the selected SPLG BP, BEW7.2 and NEU3 show that for most cantons, a large share of patients seeks out-of-canton care and is willing to travel longer than patients seeking care in their own canton. Notably, this tendency was observable across all three SPLGs.

Service-mandate patterns of neighboring cantons indicate that a considerable number of hospitals receive service mandates despite being responsible for the care of only a small share of cases (exception: IVHSM). This might suggest that for certain SPLGs, there are opportunities for better care coordination across cantons, and more efficient inter-cantonal care provision.

RQ2: As urgency and complexity are the two most important case characteristics when it comes to inpatient care planning, we used them to cluster patients with the unsupervised learning method of k-means clustering. We grouped patients into five clusters and assigned each cluster to a regional planning level considering the cluster's treatment urgency and complexity levels: nationwide for the *majority elective cases with above average complexity* cluster (6% of all cases), inter-cantonal for the *elective cases with below average complexity* cluster (31% of all cases), cantonal for the *majority emergency cases with above average complexity* cluster (15% of all cases), and regional or community level for the *emergency cases with average complexity* and the *elective and emergency cases with below average complexity* clusters (19% and 29% of all cases, respectively). Notably, for some SPLGs that we analyzed, their cases' urgency and complexity levels were quite homogeneous (e.g., BEW 7.2), while others were quite heterogeneous (e.g., the BP). Heterogeneity within one SPLG makes effective planning at any regional level very challenging, however, as measures for reaching the care planning goals of access to, and quality and costs of care might be conflicting for different clusters of the same SPLG.

RQ3: Regarding the care planning goals of access, quality, and costs, stakeholders were sceptical that current legislation and planning efforts actually aim at reaching or at least balancing all three. Hence, some stakeholders called for a definition of more distinct, more concrete objectives, possibly supported by new or altered national legislation. Furthermore, most stakeholders agreed that somatic care should not be planned for inpatients only. The need for care should rather be analyzed and forecasted regardless of the sector of service provision, and out- and inpatient care



should be planned together. Stakeholders discussed controversially whether the legislation that will follow the recent referendum on the Uniform Financing of Outpatient and Inpatient Services (EFAS) will incentivize inter-sectoral planning and cooperation between both cantons and insurers. Lastly, the stakeholders also discussed the role of patients and their relatives and patients' health literacy, stressing the influence that patients' provider choice can have on quality and costs of care.

Conclusion

Our findings show that inter-cantonal cooperation is required for patients living in border regions, especially also for services of lower complexity and/ or heterogeneous patient clusters (e.g., BP). Furthermore, SPLGs grouping highly elective services should be planned at a larger regional level, i.e., by several cantons or even nationally, even if they are not part of IVHSM. In contrast, SPLGs grouping urgent services of very low complexity and high case volumes could profit from cantonal or even more local planning levels. In addition, travel time analyses showed that at least for the analyzed SPLG, intercantonal care seeking and provision already is a reality in most parts of Switzerland, for which patients are oftentimes willing to travel considerably longer.

Lastly, even if there were different views, the discussion among stakeholders revealed that there might be a unique opportunity and political momentum to progress from sector-focused and de-central hospital capacity planning towards integrated care planning, coordination among cantons and alignment of cantonal and insurer interests.

Recommendations

Based on our findings, we derived the following recommendations as impulses for the future refinement of Swiss hospital capacity planning (or rather care planning in general):

- (I) Cantons should coordinate their service mandate assignments across a variety of SPLGs. To define which cantons should coordinate their activities in which regions, empirical patient movement – especially in border regions – and overlapping current service mandate assignments should be analyzed. These analyses have to be done separately per SPLG.
- (II) The size of a SPLG's planning region should be defined according to the complexity and urgency of the grouped services.

Care planning for larger regions comprising areas of two or more cantons or even larger parts of the country is not reserved to services part of IVHSM but could also comprise elective services of (below) average complexity.

- (III) The SPLG catalogue should be refined to define patient groups that are homogenous in terms of complexity and urgency.



SPLGs are defined to cluster medically homogenous services. While medical homogeneity should be preserved, refining SPLG definitions to group homogeneous services in terms of complexity and urgency will better support the care planning goals of ensuring access to and high quality of care while containing costs.

(IV) Political momentum to integrate care planning, to refine and standardize quality requirements, and to redistribute planning and monitoring tasks should be seized.

The EFAS referendum has initiated an intensive yet productive and definitive development process. In this process, there is an opportunity to align interests and foster coordination not only across cantons but also between cantons and insurers. In this context, cross-sectional need for care analysis and care planning, and refining and standardizing quality requirements are of outmost importance.

Together the findings and recommendations of this report can inform the recently initiated process of the GDK on cross-cantonal collaboration as well as recent advances in selected regions (e.g. SG, AI, AR, and TG).



Zusammenfassung

Hintergrund

Die akutsomatische Spitalversorgung macht einen Grossteil der Gesundheitsausgaben in der Schweiz aus. In den letzten Jahren haben die Berichte über Defizite in Spitälern zugenommen, was die akutsomatische Spitalversorgung zusätzlich zu einem wichtigen Thema der Gesundheitspolitik macht. Hohe Gesundheitsausgaben bei gleichzeitiger defizitärer Leistungserbringung werfen Fragen zur Angemessenheit der Spitallandschaft und der stationären Versorgung auf, insbesondere hinsichtlich der effizienten Nutzung von Humanressourcen und Infrastruktur.

Die Versorgungsplanung ist ein wichtiger Hebel für eine effiziente Leistungserbringung. Seit 2012 haben alle Kantone das Zürcher Modell zur Spitalbedarfsplanung (HCPM) übernommen, das den Spitälern auf der Grundlage von Spitalplanungsleistungsgruppen (SPLGs) Versorgungsaufträge zuweist, ergänzt durch die nationale Regelung zur Interkantonalen Vereinbarung zur Hochspezialisierten Medizin (IVHSM).

Trotz dieser Reformen spiegelt die aktuelle Planung die tatsächlichen Patientenströme zwischen den Kantonen noch immer unzureichend wider und berücksichtigt ausschliesslich den stationären Versorgungsbedarf. Diese Studie liefert empirische Belege und Impulse für die künftige Entwicklung der Spital- und – im weiteren Sinne – der Versorgungsplanung in der Schweiz. Die Forschungsfragen lauten:

- (1) Inwieweit stimmt die aktuelle kantonale Spitalplanung mit den tatsächlichen Patientenströmen und der Nutzung der Leistungsaufträge überein?
- (2) Wie sollten SPLGs unter Berücksichtigung von Komplexität und Dringlichkeit auf verschiedene regionale Planungsebenen verteilt werden?
- (3) Was sind die Prioritäten der Akteure des Gesundheitssystems für die Versorgungsplanung (z. B. interkantonale Planung, sektorübergreifende Planung)?

Daten und Methoden

Wir verwenden Daten zu stationären Austritten aus der Medizinischen Statistik des Bundesamtes für Statistik. Unsere Analyse konzentriert sich auf das Jahr 2022 (1,09 Millionen Fälle) und wird durch Daten aus dem Jahr 2019 (1,18 Millionen Fälle) für ausgewählte Analysen ergänzt (Vergleiche vor COVID-19 sind auf Anfrage erhältlich). Diese Studie wendet gezielte analytische und methodische Ansätze an, die auf die einzelnen Forschungsfragen abgestimmt sind. Regionale Analysen wurden auf Kantonsebene oder auf Ebene der MedStat-Regionen durchgeführt. Es gibt etwa 700 MedStat-Regionen, die auf Postleitzahlen basieren und größer als Postleitzahlgebiete, aber wesentlich kleiner als Kantone sind.



Für Forschungsfrage 1 visualisieren wir kantonsübergreifende Patientenströme, analysieren Fahrtzeiten von Patienten und vergleichen das Leistungsangebot mit den Leistungsaufträgen ausgewählter SPLGs und benachbarter Kantone in der Westschweiz. Für Forschungsfrage 2 verwenden wir k-Means-Clustering, um SPLGs nach Komplexität und Dringlichkeit der erbrachten Leistungen zu klassifizieren und diese Cluster mit passenden regionalen Planungsebenen zu verknüpfen. Für Forschungsfrage 3 stützen wir uns auf die Ergebnisse eines Stakeholder-Dialogs, der am 11. September 2025 in Bern stattfand, und geben einen Ausblick auf die Fortschritte der jüngsten Versorgungsinitiativen wie Réseau Bleu.

Ergebnisse

Frage 1: Die kantonsübergreifenden Patientenströme wurden für die ausgewählten SPLG Basispaket Chirurgie und Innere Medizin (BP), Erstprothese Knie (BEW7.2) und Zerebrovaskuläre Störungen (NEU3) analysiert. Viele MedStat-Regionen wiesen einen Anteil an ausserkantonalen Behandlungen von mehr als 25% bis 50% auf, und in einigen MedStat-Regionen lag die ausserkantonale Leistungserbringung bei fast 100%. Darüber hinaus stellen wir je nach SPLG unterschiedliche kantonale Abwanderungsmuster fest. So ist beispielsweise die Abwanderung für das BP eher in MedStat-Regionen in der Nähe von Kantonsgrenzen zu beobachten, während die Abwanderung für BEW7.2 tendenziell unabhängiger von der Grenznähe ist und durch die Lage spezialisierter orthopädischer Zentren beeinflusst wird.

Reisezeitanalysen für die ausgewählten SPLG BP, BEW7.2 und NEU3 zeigen, dass in den meisten Kantonen ein grosser Teil der Patienten eine kantonsübergreifende Versorgung in Anspruch nimmt und bereit ist, längere Wege zurückzulegen als Patienten, die sich in ihrem eigenen Kanton versorgen lassen. Bemerkenswert ist, dass diese Tendenz bei allen drei SPLG zu beobachten war.

Die Leistungsauftragsstrukturen benachbarter Kantone deuten darauf hin, dass eine beträchtliche Anzahl von Spitälern Leistungsaufträge erhält, obwohl sie nur einen kleinen Teil der eigenen kantonalen Fälle versorgen (Ausnahme: IVHSM). Dies könnte darauf hindeuten, dass für bestimmte SPLGs Möglichkeiten für eine bessere Versorgungscoordination zwischen den Kantonen und eine effizientere interkantonale Versorgung bestehen.

Frage 2: Da Dringlichkeit und Komplexität die beiden wichtigsten Fallmerkmale bei der Planung der stationären Versorgung sind, haben wir Indikatoren für diese Merkmale verwendet, um Patienten mit der Unsupervised Learning Methode des k-Means-Clusterings zu gruppieren. Wir haben die Patienten in fünf Cluster gruppiert und jedem Cluster unter Berücksichtigung der Dringlichkeit und Komplexität der Behandlung eine regionale Planungsebene zugewiesen: landesweit für das Cluster *Mehrheit elektive Fälle mit überdurchschnittlicher Komplexität* (6% aller Fälle), interkantonale für das Cluster *Elektive Fälle mit unterdurchschnittlicher Komplexität* (31% aller Fälle),



kantonal für das Cluster *Mehrheitlich Notfälle mit überdurchschnittlicher Komplexität* (15 % aller Fälle) und regional oder kommunal für das Cluster *Notfälle mit durchschnittlicher Komplexität* und das Cluster *Elektive Fälle und Notfälle mit unterdurchschnittlicher Komplexität* (19 % bzw. 29 % aller Fälle). Bemerkenswert ist, dass bei einigen der von uns analysierten SPLGs die Dringlichkeit und Komplexität der Fälle recht homogen waren (z. B. BEW 7.2), während andere recht heterogen waren (z. B. BP). Diese Heterogenität innerhalb einer SPLG erschwert jedoch eine effektive Planung, da Maßnahmen zur Erreichung der Versorgungsplanungsziele in Bezug auf Zugang, Qualität und Kosten der Versorgung für verschiedene Cluster derselben SPLG widersprüchlich sein können.

Frage 3: In Bezug auf die Versorgungsplanungsziele Zugang, Qualität und Kosten waren die Interessengruppen skeptisch, dass die aktuellen Rechtsvorschriften und Planungsbemühungen tatsächlich darauf abzielen, alle drei Ziele zu erreichen oder zumindest auszugleichen. Daher forderten Vertreter einiger Interessengruppen eine Definition klarerer, konkreterer Ziele, möglicherweise unterstützt durch neue oder geänderte nationale Regelungen. Darüber hinaus waren sich die meisten Interessengruppen einig, dass die somatische Versorgung nicht nur für stationäre Patienten geplant werden sollte. Der Versorgungsbedarf sollte vielmehr unabhängig vom Sektor der Leistungserbringung analysiert und prognostiziert werden, und die ambulante und stationäre Versorgung sollte gemeinsam geplant werden. Die Interessengruppen diskutierten kontrovers, ob die Gesetzgebung, die auf das jüngste Referendum zur einheitlichen Finanzierung von ambulanten und stationären Leistungen (EFAS) folgen wird, Anreize für eine sektorübergreifende Planung und Zusammenarbeit zwischen Kantonen und Versicherern schaffen wird. Schließlich diskutierten die Interessengruppen auch die Rolle der Patienten und ihrer Angehörigen sowie die Gesundheitskompetenz der Patienten und betonten den Einfluss, den die Wahl des Leistungserbringers durch die Patienten auf die Qualität und die Kosten der Versorgung haben kann.

Fazit

Unsere Ergebnisse zeigen, dass für Patienten, die in Grenzregionen leben, eine interkantonale Zusammenarbeit erforderlich ist, insbesondere auch für Leistungen mit geringerer Komplexität und/oder heterogenen Patientengruppen (z.B. BP).

Darüber hinaus sollten SPLGs, die hochgradig elektive Leistungen bündeln, auf einer größeren regionalen Ebene, d. h. von mehreren Kantonen oder sogar auf nationaler Ebene, geplant werden, auch wenn sie nicht Teil des IVHSM sind. Im Gegensatz dazu könnten SPLGs, die dringende Leistungen mit sehr geringer Komplexität und hohem Fallaufkommen bündeln, von einer kantonalen oder sogar noch lokaleren Planungsebene profitieren. Darüber hinaus zeigten Fahrtzeitanalysen, dass zumindest für die analysierten SPLG die interkantonale Inanspruchnahme und



Erbringung von Spitalleistungen in den meisten Teilen der Schweiz bereits Realität ist, wofür Patienten oft bereit sind, längere Fahrtzeiten in Kauf zu nehmen.

Schließlich zeigte die Diskussion unter den Interessengruppen, dass es trotz unterschiedlicher Ansichten eine einmalige Gelegenheit und ein politisches Momentum geben könnte, um von einer sektorfokussierten und dezentralen Spitalplanung zu einer integrierten Versorgungsplanung, einer Koordinierung zwischen den Kantonen und einer Angleichung der Interessen der Kantone und Versicherer überzugehen.

Empfehlungen

Auf der Grundlage unserer Ergebnisse haben wir die folgenden Empfehlungen als Impulse für die zukünftige Weiterentwicklung der Schweizer Spitalplanung (oder vielmehr der Versorgungsplanung im Allgemeinen) abgeleitet:

(I) Kantone sollten ihre Leistungsaufträge über verschiedene SPLGs hinweg koordinieren.

Um zu definieren, welche Kantone ihre Aktivitäten in welchen Regionen koordinieren sollten, sollten die empirischen Patientenbewegungen – insbesondere in Grenzregionen – und sich überschneidende aktuelle Leistungsaufträge analysiert werden. Diese Analysen müssen für jede SPLG separat durchgeführt werden.

(II) Die Größe der Planungsregion einer SPLG sollte entsprechend der Komplexität und Dringlichkeit der gruppierten Leistungen definiert werden.

Die Versorgungsplanung für größere Regionen, die Gebiete von zwei oder mehr Kantonen oder sogar größere Teile des Landes umfassen, ist nicht auf Leistungen beschränkt, die Teil des IVHSM sind, sondern könnte auch elektive Leistungen von (unter)durchschnittlicher Komplexität umfassen.

(III) Der SPLG-Katalog sollte verfeinert werden, um Patientengruppen zu definieren, die hinsichtlich Komplexität und Dringlichkeit homogen sind.

SPLGs sind definiert, um medizinisch homogene Leistungen zu bündeln. Während die medizinische Homogenität beibehalten werden sollte, würde eine Verfeinerung der SPLG-Definition zur Gruppierung homogener Leistungen hinsichtlich Komplexität und Dringlichkeit die Ziele der Versorgungsplanung besser unterstützen, nämlich den Zugang zu einer qualitativ hochwertigen Versorgung zu gewährleisten und gleichzeitig Ausgaben zu begrenzen.

(IV) Die politische Dynamik zur Integration der Versorgungsplanung, zur Verfeinerung und Standardisierung der Qualitätsanforderungen sowie zur Umverteilung der Planungs- und Monitoringaufgaben sollte genutzt werden.

Das EFAS-Referendum hat einen intensiven, aber produktiven und entscheidenden Entwicklungsprozess in Gang gesetzt. In diesem Prozess besteht die Möglichkeit, Interessen



abzustimmen und die Koordination nicht nur zwischen den Kantonen, sondern auch zwischen den Kantonen und den Versicherern zu fördern. In diesem Zusammenhang sind eine bereichsübergreifende Bedarfsanalyse und Versorgungsplanung sowie die Verfeinerung und Standardisierung der Qualitätsanforderungen von grösster Bedeutung.

Die Ergebnisse und Empfehlungen dieses Berichts können in den kürzlich initiierten Prozess der Konferenz der Gesundheitsdirektorinnen und -direktoren (GDK) zur kantonsübergreifenden Zusammenarbeit sowie in die jüngsten Initiativen in ausgewählten Regionen (z. B. gemeinsame Spitalplanung St. Gallen, Appenzell-Ausserrhoden, Appenzell-Innerrhoden, Thurgau) einfließen.



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1 Introduction

Similar to other countries, the Swiss health system is facing major challenges such as increasing healthcare expenditures, a large share of deficit hospitals, workforce shortages, and an aging population. Swiss healthcare expenditures reached nearly 12% of GDP in 2024, up from 10% in 2010, and above OECD average of 9% (Federal Statistical Office, 2025a). Moreover, Switzerland has an above-average number of hospital beds per 1,000 population (4.4 vs. 4.2 compared to OECD average) (OECD, 2025), and correspondingly, acute somatic care provided by hospitals accounts for one of the largest shares of healthcare expenditures (Federal Statistical Office, 2025a).

At the same time, financial stress for hospitals is remarkable, with cumulative hospital sector losses estimated at CHF 750 million in 2024 and the Cantonal Hospital of St. Gallen alone reporting a CHF 58.9 million deficit in 2023 (Berner, 2024; KPMG, 2024). Last but not least, demographic change leads to a higher need for care, as the size of older age groups – where hospitalizations and health service consumption are the highest (British Geriatrics Society, 2025; Federal Statistical Office, 2025a; Kallestrup-Lamb et al., 2024) – is bound to increase substantially in the next ten to 20 years (Federal Statistical Office, 2025b).

Care planning, commonly following a clear set of rules in the acute somatic care sector, is one lever to address these challenges. Some countries continue to rely on traditional methods of planning health services and resources, such as defining hospital capacity with a number of planned beds per medical specialty and hospital (Ravaghi et al., 2020). However, care planning is a complex process shaped not only by historic case volumes or the number of hospital beds, but also by population need for care and the structure of service provision (i.e., in- or outpatient) (Vogel et al., 2020). Moreover, commonly several stakeholder groups are involved, representing the interests of patients, providers, policymakers, insurers, and taxpayers.

Care planning commonly has three goals: Ensuring access to care, assuring a high quality of care, and containing costs of care (Vogel et al., 2020). These goals can be at odds, however. For instance, centralizing care, e.g., by strict implementation of minimum volume regulation (Vogel et al., 2019; Vogel et al., 2022), potentially has positive effects for the quality of care due to the well-researched volume-outcome relationship (Nimptsch & Mansky, 2017). At the same time, centralization implies that there are less providers offering a certain procedure. This in turn might increase patient travel times, especially in rural areas, with potentially negative implications for access to care.

Some countries follow a top-down care planning approach, deciding centrally what hospitals receive service mandates to treat what patient groups. Denmark, for instance, follows such a top-down approach, strongly restructuring its hospital landscape in the last ten to 15 years (Birk et al.,

2024). Other countries organize care planning with a decentral bottom-up approach. Commonly, some national legislation outlining broad objectives and general rules guides the development and implementation of specific, concrete planning rules at a sub-national level, and hospitals are to decide themselves within this regulative framework what services they intend to provide and what patient groups they intend to care for. Hospital capacity planning in Germany and Switzerland, for instance, follows such a decentralized care planning approach. While national legislation defines the goals of care planning, federal states in Germany and cantons in Switzerland are responsible for developing and implementing the specific rules for service mandate assignment (Bleibtreu et al., 2022; Subelack et al., 2024; Vogel et al., 2020).

In 2012, Switzerland implemented a nationwide hospital reform as part of the revision of the Health Insurance Law (*Krankenversicherungsgesetz, KVG*) (Bleibtreu et al., 2022). Consequentially, in collaboration with other cantons, the canton of Zurich developed a new Hospital Capacity Planning Model (HCPM). This HCPM follows a service-, need for care-, and quality oriented approach and has by now been adopted by all Swiss cantons since its inception in 2012 (Walker et al., 2025). The HCPM is based on hospital planning service groups (*Spitalplanungs-Leistungsgruppen, SPLG*). SPLGs are the basis for the assignment of service mandates at the cantonal level, while national frameworks regulate the inter-cantonal coordination of services defined as highly specialized medicine (IVHSM).

While the new HCPM is advanced compared to planning approaches in other countries, like Germany that is still in the process of adopting a service-, need-, and quality oriented HCPM (Subelack et al., 2024), two key limitations remain: (1) small area cantonal planning with cantonal borders that may not align with empirical patient flows, and (2) focus on planning of inpatient care without regards for outpatient need for care and outpatient care providers. The latter may become better addressable after regulation according to the referendum on the Uniform Financing of Outpatient and Inpatient Services (*Einheitliche Finanzierung von ambulanten und stationären Leistungen, EFAS*) has come into effect in 2028. With EFAS, uniform payment shares between insurers and cantons are to be implemented across in- and outpatient services. This might create incentives for care planning across sectors as cantons, that are both regulators, owners and payers, will have a financial interest to develop regulation and an approach for efficient allocation of outpatient service mandates.

With regards to the two outlined limitations of the current Swiss HCPM (cantonal and sectoral borders), this study addresses the following research questions:

1. To what extent does current cantonal hospital planning align with real-world patient flows and service mandate utilization?

2. How should SPLGs be allocated to different regional planning levels, considering complexity and urgency?
3. What are health system stakeholders' priorities for care planning (e.g., inter-cantonal planning, inter-sectoral planning)?

By investigating these research question, we aim to supply empirical evidence and impulses for the future of hospital capacity planning - or rather care planning - in Switzerland. Consequently, the remainder of this report is organized as follows. Section 2 describes the datasets and analytical methods. Section 3 presents the main findings. Section 4 discusses findings and limitations, and section 5 presents policy recommendations.

2 Data and Methods

2.1 Data

We use the Medical Statistics (*Medizinische Statistik* or *Gesundheitsversorgungsstatistik*), available upon request from the Swiss Federal Statistical Office (FSO). We use data from 2019 and 2022. Our main results are based data from 2022. The period between 2020 and 2021 falls within the period of the outbreak of the COVID-19 pandemic and is therefore excluded from the analysis. For some analyses, we use the 2019 data for sensitivity analyses of pre-COVID-19 need for care. The results of these sensitivity analyses did not show major differences to the main analyses and are available upon request. To cluster patients according to their complexity and urgency level, addressing the second research question, we pooled the 2019 and 2022 data to increase the sample size and the robustness of our clustering results (cf. chapter 2.2).

The dataset comprises all inpatient discharge records of all Swiss acute somatic care hospitals. The dataset includes patient demographics (gender, 5-year age bands¹, etc.), residential location (given by the patient's MedStat Regions²), the canton where the patient was treated, procedures as coded in the Swiss Operations and Procedures Catalogue ("Schweizerische Operationsklassifikation", CHOP), main and secondary diagnoses as coded in the International Classification of diseases,

¹ The analysis used the midpoint of each five-year age band. For instance, for the 0–4 year band, the value 2 was used.

² MedStat regions are based on zip-codes and are larger than zip-code areas but much smaller than cantons. Among other things, MedStat regions are utilized to indicate a place of residence for each hospitalized individual, ensuring anonymity of individuals.

Version 10, German Modification (ICD-10-GM), diagnosis-related group (DRG) codes, and hospitalization details (e.g., date of admission and discharge).

Data pre-processing involved two steps: (1) classification of each inpatient case to the respective SPLG, and (2) data cleaning. With respect to step (1), we obtained the SPLG-Grouper Akutsomatik 2023.0.64 software for research purposes upon request from the canton of Zurich. The grouper assigns cases to one unique SPLG using the ICD and CHOP codes for the corresponding year. Regarding step (2), the data cleaning process is outlined in Appendix 1. Main data cleaning steps were, for instance, removing invalid records for acute somatic care by checking hospital length of stay (LOS), ICD, CHOP and SPLG codes. Moreover, for the patient migration and patient flow analyses, we did not include patients without a residence in Switzerland. The final sample for 2022 (2019) contained 1.09 million (1.18 million) cases.

2.2 Methods

We conducted several analyses for exemplary SPLGs. SPLG selection is tailored to the specific research questions (see Table 1). This selection includes both federally regulated IVHSM services (Severe Strokes and Heart Transplantation) and regular SPLGs.

Table 1. Overview of analyses and investigated SPLGs per research question

Analyses	Investigated SPLGs	Data years
RQ1: To what extent does current cantonal hospital planning align with real-world patient flows and service mandate utilization? (<u>Short:</u> Alignment of planning and empirical evidence)		
<ul style="list-style-type: none"> Visualization of cross-cantonal movements for selected SPLGs Travel time analysis for selected SPLGs Cantonal service provision vs. service mandates for selected cantons and SPLGs	BP, BEW7.2, HNO1, NEU3, NEU3.1, NCH1, TPL1	2022
RQ2: How should SPLGs be allocated to different regional planning levels, considering complexity and urgency? (<u>Short:</u> Allocation of SPLGs to regional planning levels)		
<ul style="list-style-type: none"> Classification of SPLGs with respect to complexity and urgency of services using k-means clustering Allocation to planning authority and level based on cluster characteristics 	BP, BEW7.2, HNO1, NEU3, NEU3.1, NCH1, TPL1, BEW8, BEW8.1, GEB1, VIS1	2019 and 2022
RQ3: What are health system stakeholders' priorities for care planning (e.g., inter-cantonal planning, inter-sectoral planning)? (<u>Short:</u> Future priorities for care planning)		
Stakeholder dialogue with participants from hospitals, cantonal health departments, politics, health insurances, and academia	-	-

Annotations: Basic package for surgery and internal medicine (BP), Primary Knee Replacement (BEW7.2), Ear–Nose–Throat Surgery (HNO1), Cerebrovascular Disorders (NEU3), Severe Stroke (NEU3.1), Cranial Neurosurgery (NCH1), Heart Transplantation (TPL1), Spine Surgery (BEW8), Complex Spine Surgery (BEW8.1), Basic Obstetric Care (GEB1), Visceral Surgery (VIS1). A full list of SPLGs can be found online on the [website of the Health Directorate of Zurich](#). A full list of IVHSM SPLGs can be found online on the [website of the Conference of Health Directors](#). For RQ 1, all or a subset of the indicated SPLGs were investigated per analysis, see details below.

Research Question 1: Alignment of planning and empirical evidence

Visualization of cross-cantonal movements for selected SPLGs

This analysis investigates movement of patients between cantons with a special focus on border regions to analyse patient flow intensity. Analyses are performed on a selection of SPLGs: Primary Knee Replacement (BEW7.2), Cerebrovascular Disorders (NEU3), and the Basic Package for surgery and internal medicine (BP). We selected these SPLGs as they differ in terms of emergency share, medical complexity and required specialization, which potentially affect patients' provider choice (Kuklinski et al., 2021).

We employed the following approach to detect regions with high patient migration. For each MedStat region i , we calculated the share of patients p receiving treatment outside their home canton $p_i = N_{i,out} / N_{i,total}$ with N denoting the number of patients seeking out-of-canton treatment (N_{out}) and the total number of patients (N). We visualize the outflow ratio (p_i) on maps. As examples for border regions, we analyzed patient outflows from Rapperswil, Bad Ragaz, and Mesocco in detail (MedStat regions SG30, SG24 and GR26).³ This analysis is inspired by Klauss et al. (2005) and regular reports from Swiss Atlas of Health Care (Swiss Health Observatory, 2025), defining hospital service areas based on the local index which reflects actual patient flows while ignores administrative boundaries.

Travel time analysis

We used the OSRM package in R (version 4.5.2) to calculate driving times from the centroid of each patient's MedStat area to the respective hospital address for all cases. The OSRM routing service is based on OpenStreetMap data. The FSO then facilitated the integration of the calculated travel times into the original Medical Statistics dataset by linking them with the individual patient records.

We generated visualizations comparing average travel times between outflow patients and local patients (i.e., patients treated within their canton of residence) for selected SPLGs. Each plot displays the average travel time of local patients (x-axis) versus the average travel time of outflow patients (y-axis), with bubble sizes scaled proportionally to represent the canton's outflow share.

³ Rapperswil is located in the canton of St. Gallen, bordering the canton of Zurich. Bad Ragaz is also located in St. Gallen at the Grisons border. Mesocco is a municipality in the canton of Grisons, located in Mesolcina where Italian is the primary official language and bordering the Ticino. There are 706 [MedStat regions](#) in Switzerland. We chose these three exemplary regions to investigate patient movement in border areas.

Cantonal Service Mandate Portfolios

With this analysis, we aim to build first hypotheses for potential redundancy in hospital service mandate assignment in neighboring cantons, identifying potential opportunities for cross-cantonal service mandate consolidation based on service mandate utilization. We chose the following exemplary seven neighboring cantons in the Western part of Switzerland: Jura (JU), Neuchâtel (NE), Fribourg (FR), Bern (BE), Valais (VS), Vaud (VD), Geneva (GE). For a full list of all 26 Swiss cantons, see the [FSO website](#).

To assess service mandate utilization, we analyzed how many hospitals provided services for a given SPLG and how many hospitals accounted for 80% of the total cantonal case volume (and 90% in a sensitivity analysis). We included patients from both the hospital's own canton and other cantons in the total cantonal case volume to capture cross-cantonal service provision.

A common issue in hospital billing data is the appearance of hospitals treating only single or a very small number of cases for a selected SPLG. In most instances, these observations do not reflect true service provision by the hospital. Instead, they may either represent transferred patients who arrived after the main treatment was completed elsewhere, single cases treated in an emergency setting, or simply data entry errors. To exclude such hospitals from our analysis, we followed a filtering approach also employed in other studies (Vogel et al., 2020): For each SPLG, we (1) ranked all hospitals by their case volume, and (2) excluded all hospitals at the bottom of that ranking as long as their cumulative case volume remained lower than 2.5% (see Appendix 2 for the number of excluded hospitals per SPLG and canton and their case volumes).

Research Question 2: Allocation of SPLGs to regional planning levels

Classification of SPLGs with respect to complexity and urgency of services using k-means clustering

For care planning, there are two guiding principles (Vogel et al., 2020): (1) The more complex and/or the rarer a treatment, the stronger centralization efforts should be, and (2) emergency cases need immediate care, implying the need for short patient travel times. Principle (1) is based on the empirical volume-outcome relationship, indicating that high-volume centers tend to exhibit lower risk-adjusted mortality or complication rates than low-volume hospitals (Nimptsch & Mansky, 2017). Principle (2) is also based on medical evidence, showing that time-to-treatment is essential for the quality of emergency care, e.g., for stroke, AMI or polytrauma patients (Powers et al., 2018). Naturally, in practice, adhering to these principles is difficult due to various reasons, not least because some indications and their treatment are both urgent and complex (e.g., stroke).

Another challenge could arise from the composition and definition of SPLGs. Concretely, if an SPLG is very homogenous in terms of complexity level and required treatment urgency, planners are more able to adhere to the above-outlined guiding principles. If an SPLG is heterogenous in terms of complexity and urgency, however, planners might be confronted with hardly surmountable challenges as one subgroup of the SPLG would require stronger centralization while the other might require timely treatment and higher service mandate density.

In the context of our research endeavor, we therefore investigate the composition of selected SPLGs with regards to urgency and complexity in order to define a planning region – regardless of cantonal borders – that would best support the triple aim of care planning outlined in the introduction. We group patients within an SPLG along eight variables, seven for complexity and one for urgency (cf. Table 2). To estimate the urgency of treatment, we facilitate the “reason for admission” variable recorded in hospital administrative data. There is evidence, however, that the data quality of such indicators is low (Krämer et al., 2019). More reliable indicators for treatment urgency like exact time stamps of hospital admission and first undertaken procedure, were not available to us due to data privacy restrictions, however.

Table 2. Overview of variables used for clustering of patients

Dimension	Variable	Reasoning
Complexity	DRG cost weight	Represents average resource intensity and can serve as a proxy for clinical complexity
	Length of Stay (LOS)	Reflects the care duration and is associated with hospital resource utilization
	Interdisciplinary treatment	Measured by the number of CHOP-catalogue chapters the procedures of a patient are categorized in. The level of interdisciplinarity correlates with the complexity of the treatment.
	Intensive care unit (ICU) stay	Indicates whether the patient was admitted at least once to the ICU during their hospital stay; represents the level or required care of a patient
	Elixhauser Index	Measures a patient’s comorbidity burden
	Age	Measured with 5-year age bands (0-4, 5-9, 10-14, etc.); captures patient demographic profile and care needs
	Inpatient death	Indicates whether the patient has died during the hospital stay, represents treatment risk and severity of underlying sickness
Urgency	Reason for admission: Emergency (treatment within 12 hours)	Indicates the immediacy of required care with varying data quality (see above)

Annotations: Multicollinearity is not relevant for k-mean clustering because it does not estimate coefficients. It groups observations by minimizing within-cluster distances. Correlated variables only reshape the feature space; they do not destabilize any parameter estimates. More variables increase the exact representation of each data point which sharpens the delineation of cluster structure. If the added variable carries a non-redundant signal, cluster boundaries become more precise (Dormann et al., 2013). The Elixhauser comorbidity index is computed based on the coding of comorbid diseases according to (Sharma et al., 2021) and the weighting according to (Van Walraven et al., 2009).

For this investigation, we followed a data-driven approach, namely k-means clustering. K-means clustering is an unsupervised machine learning method. Based on the observations' characteristics, unsupervised learning algorithms identify patterns in the data that indicate group boundaries and thereby enable grouping of cases. Specifically, the k-means algorithm groups similar cases by minimizing the sum of squared distances between cases, ensuring that cases within a cluster are more similar to each other than to those in different clusters (Milligan & Cooper, 1985; Singh et al., 2013). We chose k-means clustering as this method has been shown to efficiently group observations according to underlying case-level patterns (Milligan & Cooper, 1985). This unsupervised learning approach identifies patient profiles without relying on predefined categories, providing a scalable approach for assigning SPLGs to appropriate regional planning levels. Z-score standardization of all continuous variables was applied before clustering to account for different scales of the variables describing patient characteristics. Then, we allocate 11 exemplary SPLGs to regional planning levels based on the characteristics of the clusters, the SPLG comprises.

Research Question 3: Future priorities for care planning

Stakeholder Dialogue

To understand the interests, incentives, and potential conflicts among key stakeholders directly or indirectly involved in hospital capacity planning, we conducted a stakeholder dialogue in the form of a workshop. Eight participants attended to represent different stakeholder groups: hospital management (3), cantonal health authorities (2), health policy makers (1), health economists/research (1), and health insurers (1). Before the workshop, participants completed a short questionnaire to capture preliminary views and support a focused discussion (see Appendix 3). The workshop was conducted on September 11, 2025.

To get feedback on some preliminary results for RQ1 and RQ2 and their insights on practical feasibility, governance challenges, and policy implications of inter-cantonal cooperation, the workshop was structured around two core questions: (1) whether inter-cantonal hospital capacity planning can serve as an effective tool for shaping the hospital landscape, and (2) what opportunities and barriers exist for its implementation.

Three moderators from the research team facilitated the discussions using predefined guiding questions (see Appendix 4), while encouraging participants to exchange views and reflect on one another's perspectives. All contributions were documented, recorded, transcribed and consolidated for subsequent qualitative analysis by two research assistants. The moderating language was German, participants discussed in German or in French, and slides with results of preliminary analyses were shown in English.

3 Results

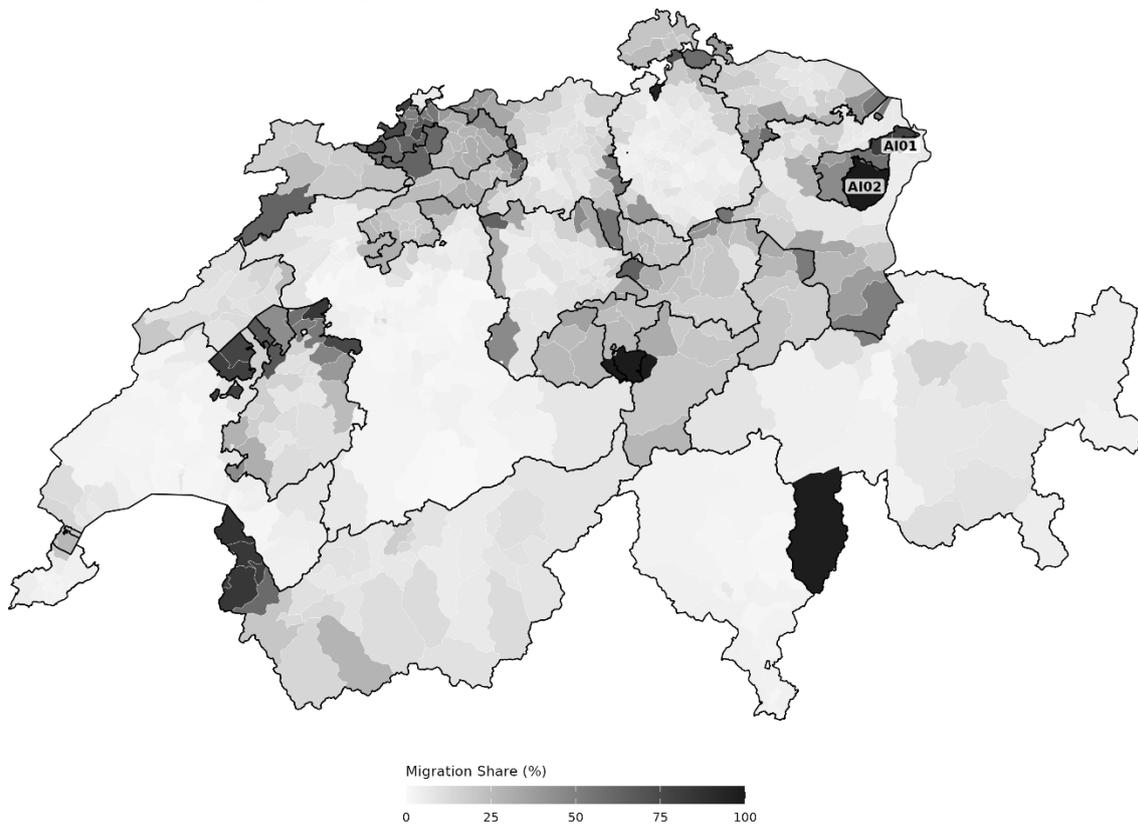
3.1 Research Question 1: Alignment of planning and empirical evidence

Visualization of cross-cantonal movements for selected SPLGs

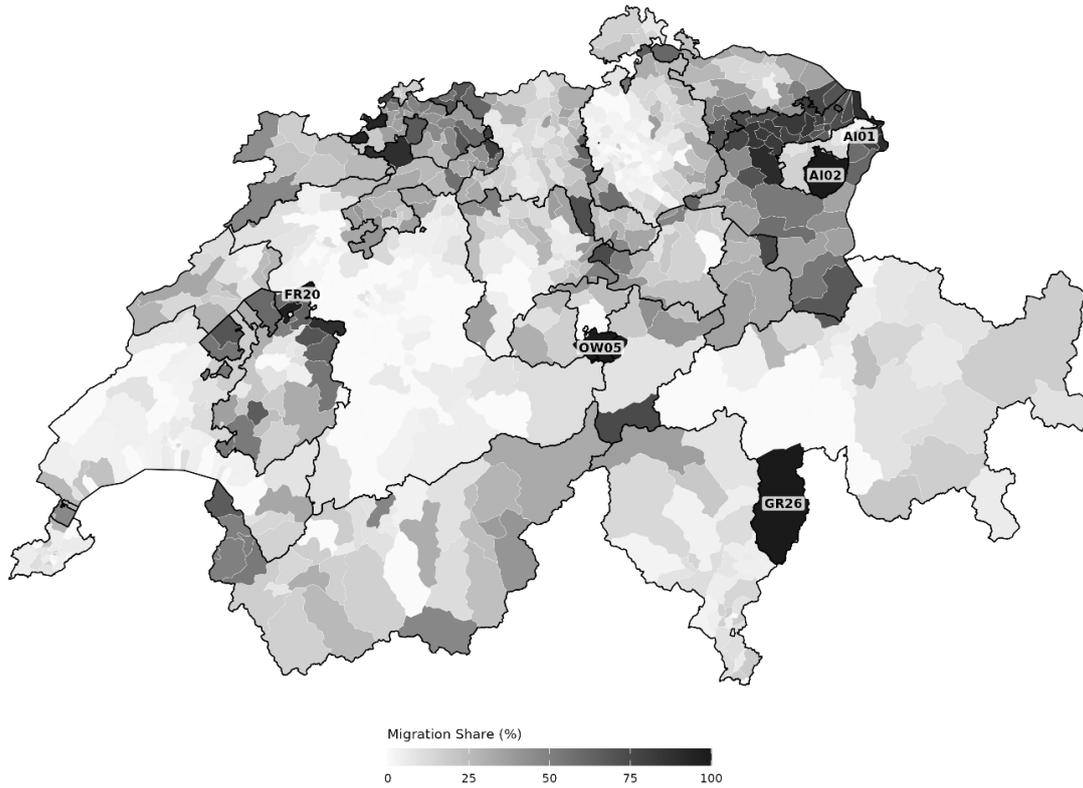
Figure 1 below shows the share of patients that seek out-of-canton treatment for the three exemplary SPLGs: BP, BEW7.2 and NEU3 (Panel A, Panel B and Panel C). Lighter (darker) shades of MedStat regions indicate a lower (higher) migration share.

Figure 1. Cross-Cantonal Migration Shares for selected SPLGs, 2022

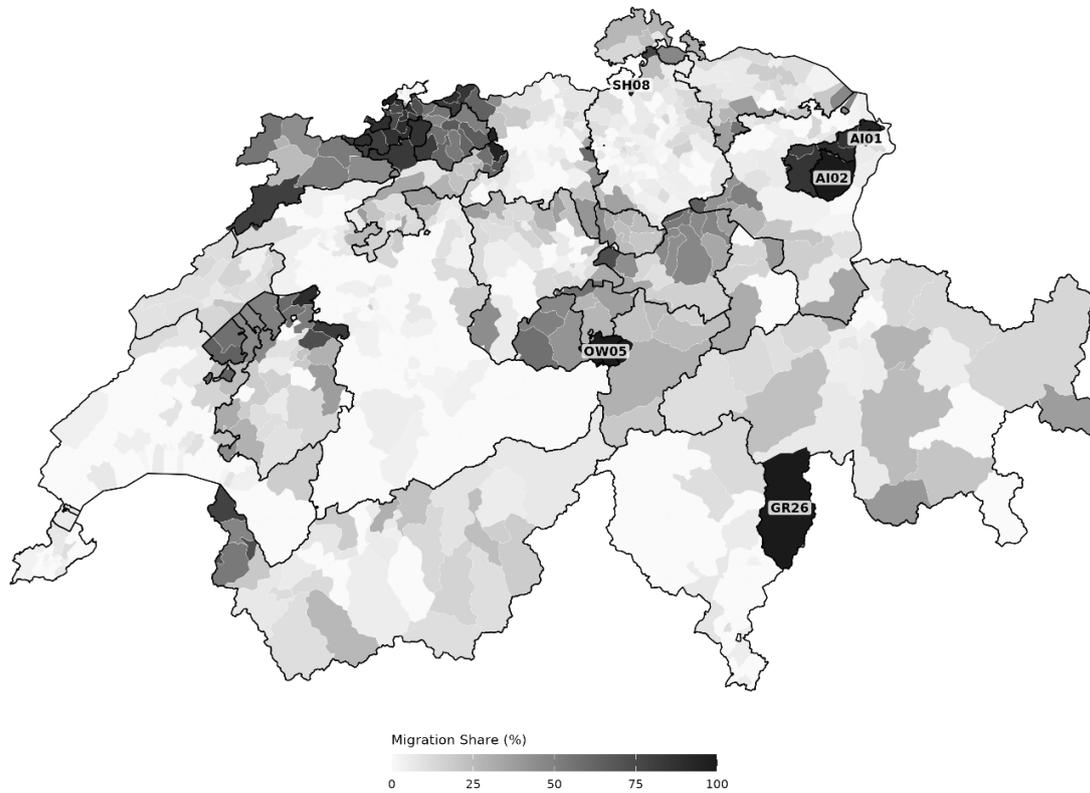
Panel A - Basic Package of surgery and internal medicine (BP)



Panel B – Primary Knee Replacement (BEW7.2)



Panel C - Cerebrovascular disorders (without stroke unit) (NEU3)



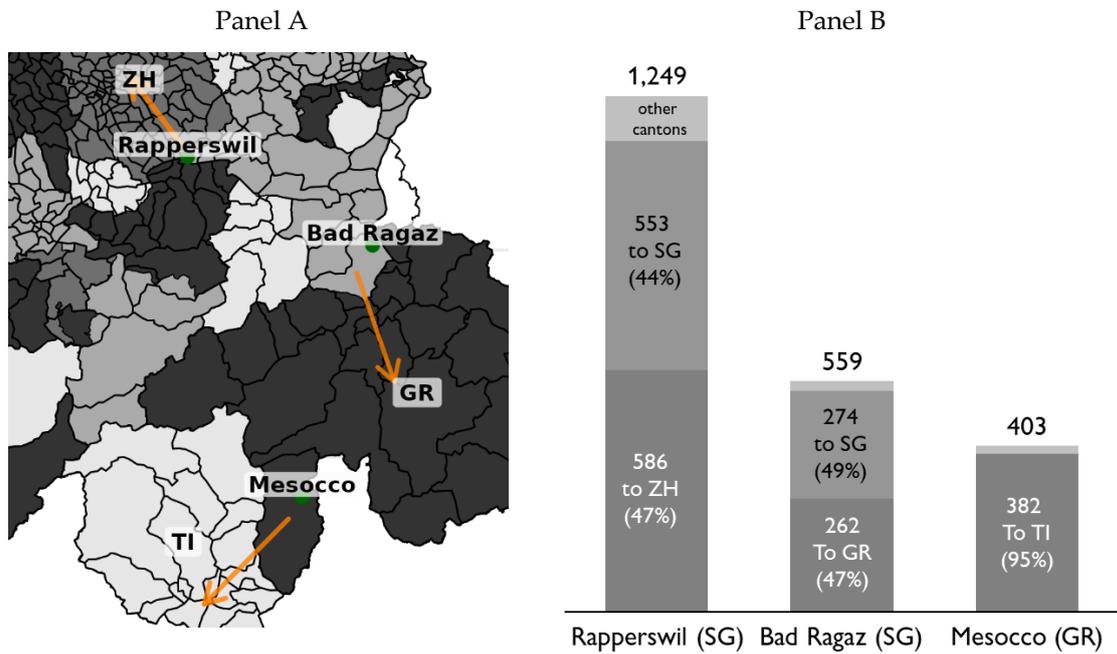
Annotations: Maps show cross-canton patient migration shares at the MedStat region level (scale 0% to 100%). Migration volume means all patients treated outside their canton of residence. Migration volume is compared with the total case volume. Darker shades indicate higher cross-canton migration proportions. Labeled regions indicate a migration ratio of 100%. The exact case volumes of MedStat regions with cross-canton migration shares above the threshold of 25% are available as online supplement.

Figure 1 reveals four key insights:

- (1) There is considerable cross-canton patient movement for all three exemplary SPLGs, which are quite different in terms of complexity and urgency of included services (cf. chapter 0). Notably, patient migration is the strongest for the elective SPLG BEW7.2, with the north-eastern part of Switzerland showing especially high migration shares.
- (2) Cross-canton movement is the strongest in border regions for all selected SPLGs – with small differences between SPLGs. For the BP, only the border regions show high migration shares, while for BEW7.2 cantonal outflows are more independent of border vicinity but are influenced by where specialized orthopaedic centers are located.
- (3) Inter-cantonal migration can especially be observed in the Western parts of the Valais, Fribourg, the cantons of central Switzerland, the Basels and Solothurn, Jura, Mesolcina, the Southern and Western parts of St. Gallen, and parts of Schaffhausen. For some regions, this migration can be explained by existing inter-cantonal cooperation like for the Basel region or in the Western parts of Valais. For the latter, the cantons of Valais and Vaudt established the hospital Riviera Chablais in the canton of Vaudt with a defined inter-cantonal service mandate.
- (4) Patient migration seems to be driven by (non-) availability of care structures (e.g., parts of Obwalden and the Appenzells), centers (e.g., Appenzell-Ausserrhoden for BEW7.2) and primary spoken language (e.g., Mesolcina, Jura, Valais-Vaudt, Fribourg).

In Figure 2, Figure 3, and Figure 4, we examine patient migration for the three border MedStat regions Rapperswil (St.Gallen (SG)), Bad Ragaz (SG), and Mesocco (Grisons (GR)) more closely. For the BP, patients from Rapperswil (SG) ($n = 1,249$) mainly chose to be treated in Zurich (ZH) (586 patients, 47% of total), while only 44% of patients were treated in SG, their canton of residence. Similar patterns were observed for Bad Ragaz (SG) with 47% of patients treated in GR. Mesocco (GR) recorded even larger outflows with 95% of patients treated in Ticino (TI) (cf. Figure 2).

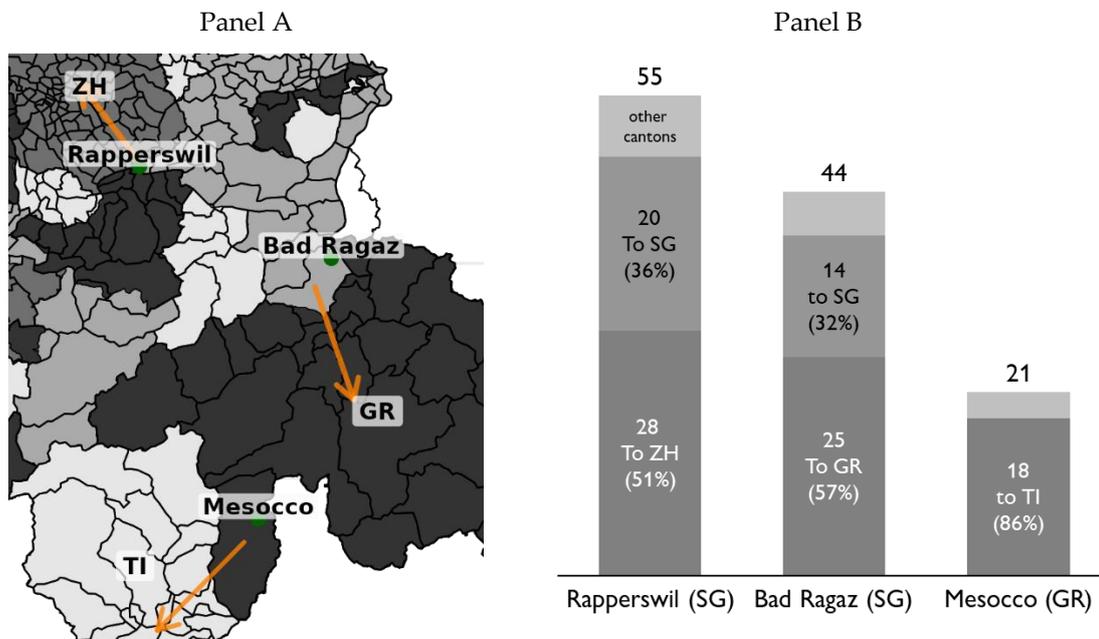
Figure 2. Cross-cantonal patient flows in border municipalities for the BP, 2022



Panel (a) illustrates inter-cantonal patient movements from Rapperswil (SG30), Bad Ragaz (SG24), and Mesocco (GR26) toward the canton where patients received treatment. Arrows indicate the patient flow directions. Panel (b) shows the corresponding case numbers and share of patients treated within their own canton or other cantons.

For BEW7.2, patient migration is similar to the BP: For the three investigated MedStat regions, the majority of patients sought treatment outside of their canton of residence (see Figure 3).

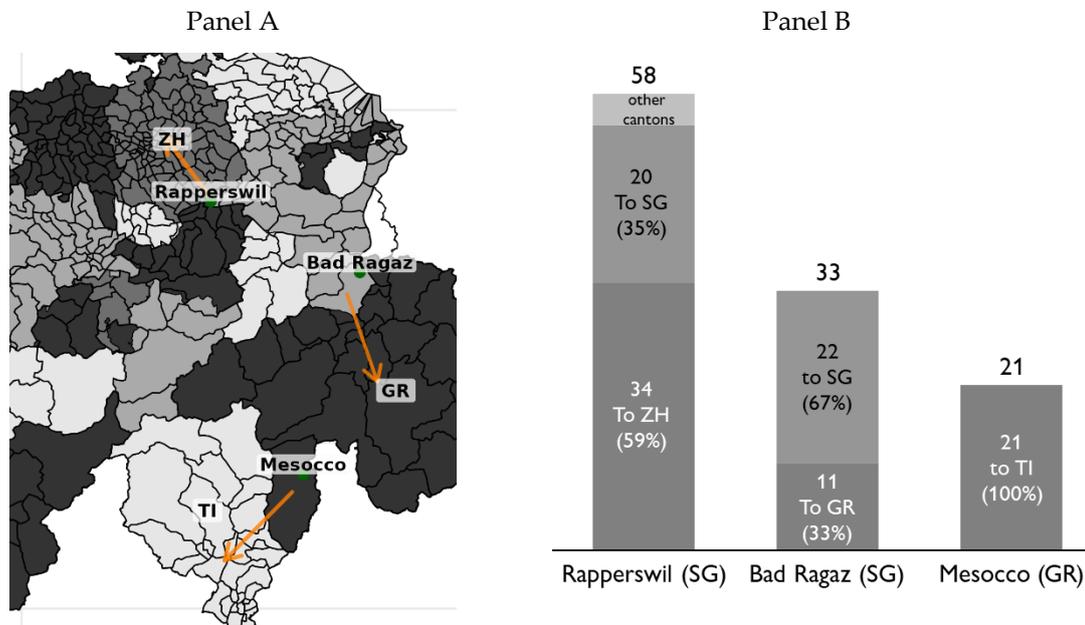
Figure 3. Cross-cantonal patient flows in border municipalities for BEW7.2, 2022



Panel (a) illustrates inter-cantonal patient movements from Rapperswil (SG30), Bad Ragaz (SG24), and Mesocco (GR26) toward the canton where patients received treatment. Arrows indicate the patient flow directions. Panel (b) shows the corresponding case numbers and share of patients treated within their own canton or other cantons.

A slightly different picture can be seen for NEU3 (see Figure 4). While out-of-canton patient migration from Mesocco to TI persists, migration from Rapperswil to ZH is even higher, while migration from Bad Ragaz to GR is lower than for the BP and BEW7.2.

Figure 4. Cross-cantonal patient flows in border municipalities for NEU3, 2022



Panel (a) illustrates inter-cantonal patient movements from Rapperswil (SG30), Bad Ragaz (SG24), and Mesocco (GR26) toward the canton where patients received treatment. Arrows indicate the patient flow directions. Panel (b) shows the corresponding case numbers and share of patients treated within their own canton or other cantons.

Travel time analysis

Table 3 presents the total case volumes and outflow shares by canton for the BP, BEW7.2, NEU3. Generally, outflow shares are quite high. For the BP and NEU3, outflow shares are higher than 20% for 13 out of 26 cantons. For BEW7.2, outflow shares are higher than 20% for 16 out of 26 cantons. We observe high variation in outflow shares across cantons. Small cantons such as AI, AR and BL exhibit high outflow shares across all three SPLGs, indicating reliance on out-of-canton care for these services. In contrast, residents of larger cantons with comprehensive hospital infrastructure, such as ZH (5-10%), BE (3-4%), and VD (4-7%), predominantly seek care in their own canton. Mid-sized cantons showed considerable variation by SPLG. For instance, SG ranged from 14% (BP) to 65% (BEW7.2), suggesting differences in local capacity and competitive out-of-canton service provision across medical specialties.

Table 3. Patient volumes and outflow shares by canton across three SPLGs 2022

Canton	BP		BEW7.2		NEU3	
	Total Case Volume	Outflow Share	Total Case Volume	Outflow Share	Total Case Volume	Outflow Share
AG	36'503	16%	1'884	25%	1'805	13%
AI	808	100%	55	100%	42	100%
AR	2'991	53%	147	14%	122	80%
BE	59'866	4%	3'355	4%	2'923	3%
BL	21'309	51%	970	48%	947	73%
BS	16'202	8%	543	19%	615	4%
FR	15'613	28%	911	38%	636	32%
GE	23'946	4%	892	7%	812	3%
GL	2'648	22%	140	32%	110	15%
GR	12'590	9%	726	11%	541	13%
JU	5'765	18%	246	26%	280	42%
LU	18'855	15%	985	19%	617	13%
NE	4'132	28%	120	71%	256	27%
NW	2'276	25%	86	23%	114	38%
OW	2'025	32%	139	28%	76	53%
SG	29'392	14%	1'518	65%	1'116	11%
SH	4'995	21%	292	17%	223	23%
SO	17'613	31%	927	42%	660	39%
SZ	9'283	25%	455	30%	361	42%
TG	16'671	23%	836	39%	706	19%
TI	21'884	3%	752	10%	652	2%
UR	2'197	20%	121	36%	84	25%
VD	37'227	5%	1'909	7%	1'375	4%
VS	16'427	8%	966	21%	612	11%
ZG	6'979	22%	272	25%	302	29%
ZH	77'165	7%	3'604	10%	3'231	5%

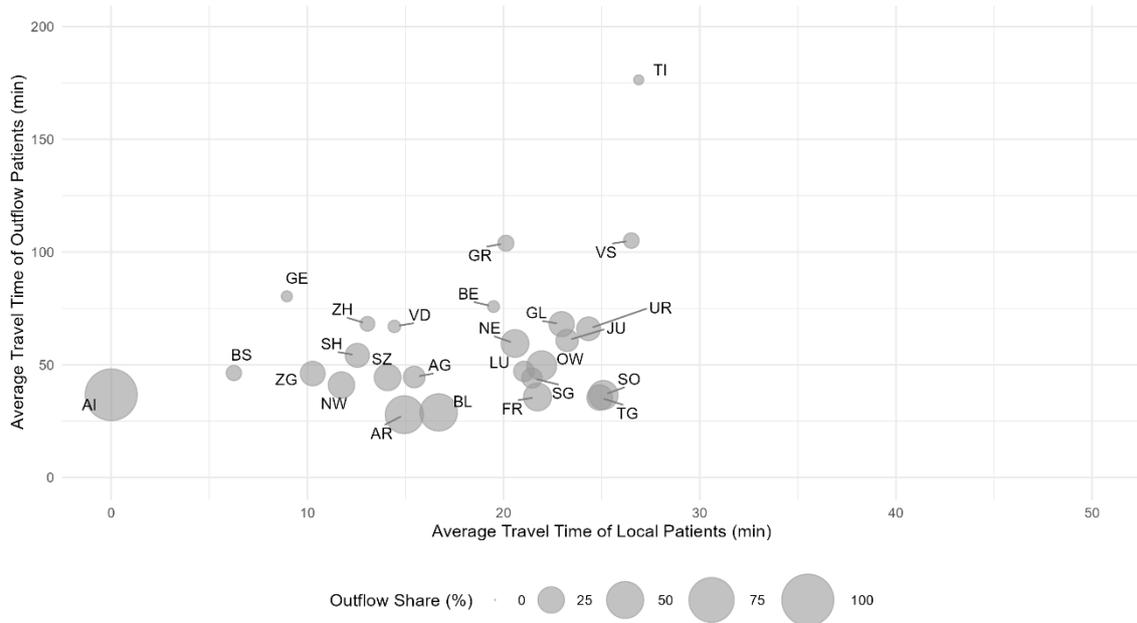
Figure 5 presents the relationship between the average travel time of outflow and local patients. Across SPLGs, patients seeking care in their own canton travel between 10 to 30 minutes on average for most cantons. One exception is AI, where no local hospital provides services. Notably, average travel times are not exorbitantly higher for AI patients, but between 25-35 minutes. Other exceptions are the mountainous cantons GR, VS and TI. Generally, average travel times are the highest for both outflow and local patients for these cantons, while outflow shares are comparatively small.

Together with Table 3, the analysis presented in Figure 5 shows that (1) for all three selected SPLGs, there are a high number of cantons with high outflow shares, and (2) outflow patients seeking out-of-canton care are generally willing to travel longer. We acknowledge that for some cantons, outflow shares and average travel times are strongly influenced by the availability or rather lack

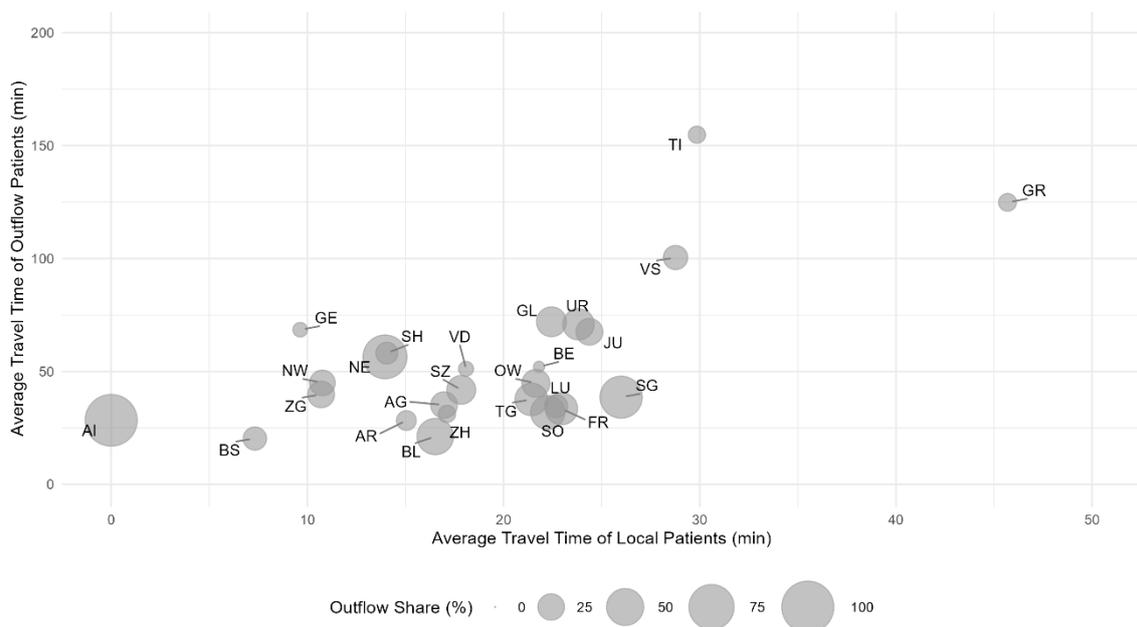
of local service provision. Still, as outflow shares and out-of-canton average travel times are also quite high for the BP, we may conclude that empirically, intercantonal care already is a reality in many parts of Switzerland and utilized by patients.

Figure 5: Relationship between average travel times of local and outflow patients, 2022

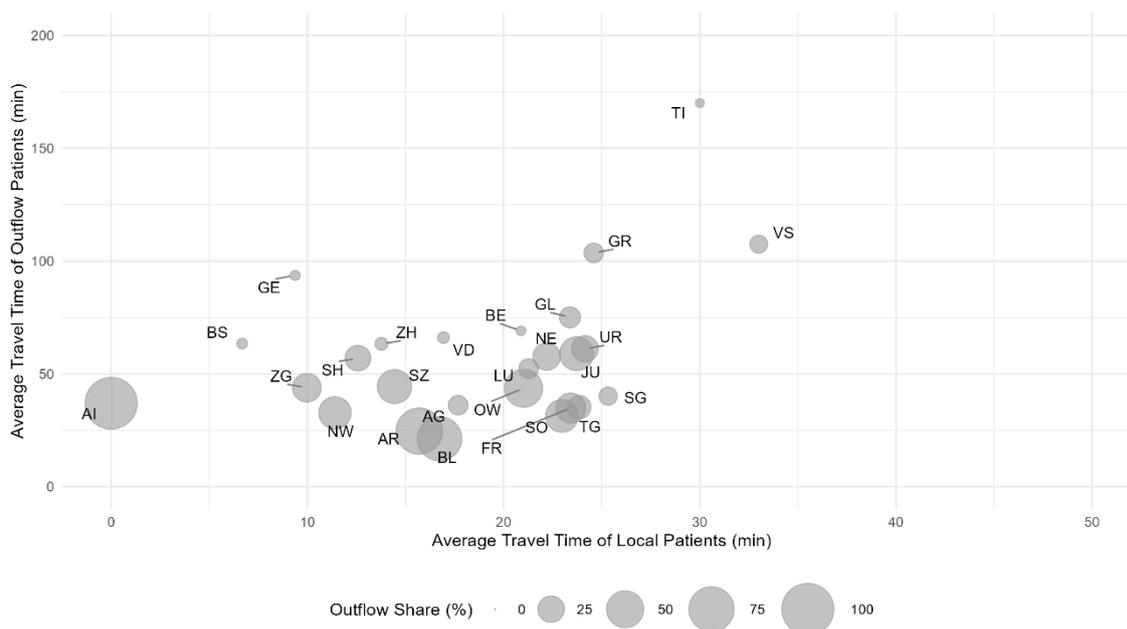
Panel A – Basic Package (BP)



Panel B – Primary knee replacement (BEW7.2)



Panel C – Cerebrovascular disorders (without stroke unit) (NEU3)



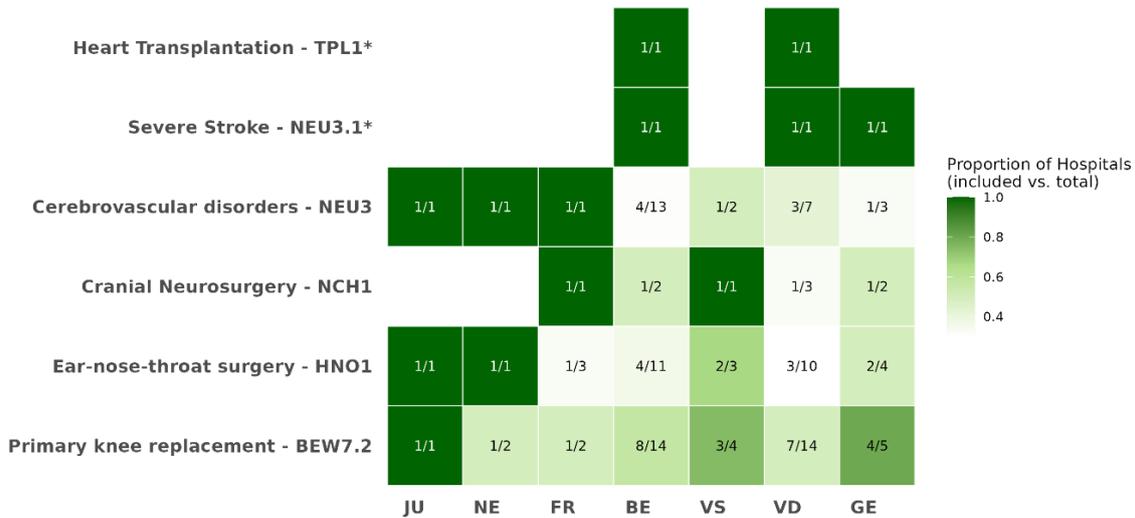
Cantonal Service Mandate Portfolios

Figure 6 illustrates the number of hospitals providing 80% (Panel A) and 90% (Panel B) of services of an SPLG compared to the total number of hospitals with a cantonal service mandate. This analysis can hint at potential service mandate overlaps across cantons and corresponding opportunities for inter-cantonal cooperation. Note that service mandates are assigned for inpatient acute somatic care, and outpatient care is not subject to cantonal service mandate assignment. Accordingly, the listed case volumes in the annotations to Figure 6 include only inpatient cases.

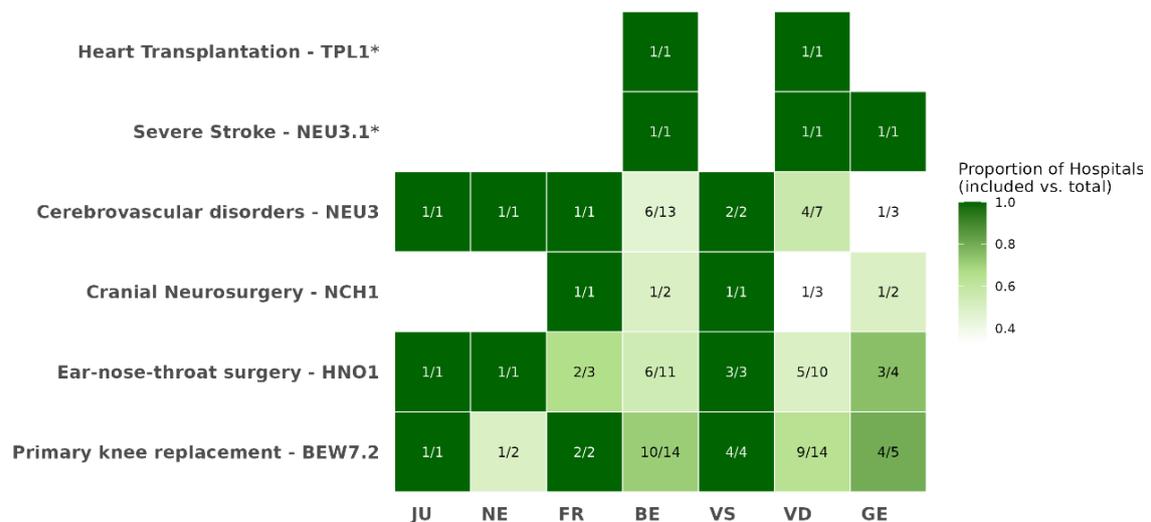
The findings indicate that for most SPLGs and cantons, 80% or 90% of cantonal case volumes are cared for by one third to four fifths of the hospitals with a service mandate. Exceptions are SPLGs that are not directly planned by cantons but are part of the IVHSM (TPL1 and NEU3.1). The canton of JU is also an exception, as service mandates are fully utilized. For the SPLGs of moderate complexity NEU3 and NCH1, an excess number of assigned service mandates is less frequent, and the canton VS fully utilizes its assigned service mandates to cover 90% of cantonal case volume. FR also almost fully utilizes its service mandates in the 90% cantonal case volume coverage analysis, and NE is close for both 80% and 90% case coverage.

Figure 6. Hospitals Covering at least 80% and 90% of Total Cantonal Case Volume, 2022

Panel A – 80% Case Coverage



Panel B – 90% Case Coverage



Annotations: Color intensity corresponds to the ratio of hospitals caring for 80% / 90% of cantonal cases vs. hospitals with a service mandate, with darker green representing a higher proportion of hospitals used to reach the 80%/ 90% threshold. Hospitals with extremely low case volumes were not included in the analysis (cf. Methods). (1) For BEW7.2, BE used eight of its 14 hospitals to treat 80% and 10 hospitals to treat 90% of its 3,796 cases. In the VD, 7 of 14 hospitals cared for 80% of the cantonal case volume of 2,243 cases. Other cantons in the Romandie region showed similar trends. JU recorded a total of 189 cases. (2) For NEU3, in the canton of BE 4 of 13 hospitals with a service mandate treated 80% of 1,865 cases, while in the VD, 3 of 7 hospitals with a service mandate cared for 80% of 828 cases. VS used 1 of 2 hospitals for 80% of 481 cases, and GE used 1 of 3 for 80% of 398 cases. JU, NE, and FR recorded 36, 466, and 330 total cases, respectively. (3) For HNO1, in FR 1 of 3 hospitals with a service mandate cared for 80% of 228 cases, in BE 4 of 11 hospitals with a service mandate treated 80% of 1,561 cases, in VD 3 of 10 hospitals with a service mandate cared for 80% of 640 cases, in GE 2 of 4 hospitals cared for 80% of 938 cases; JU, NE, VS recorded 71, 215, 280 cases, respectively. (4) For NCH1, TPL1, and NEU3.1 relatively small case volumes were reported, e.g., TPL1 recorded only eight cases in BE, and twelve in VD.

In the cantons of BE, VD and GE, the utilization of assigned service mandates for both 80% and 90% case coverage is relatively low. There could be several reasons for this observation. For instance, with regards to HNO1, the broader distribution of service mandates could be reasoned with a shift toward more outpatient care provision – with inpatient service mandates available in case of complications or multimorbid patients. Similarly, the emergency nature of NEU3 could warrant wider geographic coverage. In contrast, the high number of hospitals providing BEW7.2 - comprising elective procedures - suggests potential overcapacity. These findings point towards potential for greater inter-cantonal coordination, particularly in SPLGs where multiple cantons sustain underused service mandates.

3.2 Research Question 2: Allocation of SPLGs to regional planning levels

Using k-means clustering, we grouped all inpatient cases into five clusters⁴ without predefined categories, capturing hidden patterns across multiple variables (see Table 2 in the Method section). The results of the clustering based on z-scores of variables are shown in Table 4.

All patients in cluster 1 were admitted to the hospital as an emergency case. Their age was slightly above the sample's average, and their comorbidity level, interdisciplinary treatment and resource use in terms of DRG cost weight and LOS were all slightly below average. They had a low intensive care unit (ICU) utilization of roughly 8% and a raw inpatient mortality rate of roughly 2%. We named this cluster *Emergency cases with average complexity*. Overall, 19% (~426,000) of all cases were grouped into this cluster.

All patients in cluster 2 were admitted to the hospital as elective cases. Their age was slightly above the sample's average, and their comorbidity level, interdisciplinary treatment and resource use in terms of DRG cost weight and LOS were all slightly below average. They had a very low ICU utilization of roughly 3% and a raw inpatient mortality rate of roughly 0%. We named this cluster *Elective cases with below average complexity*. Overall, 31% (~703,000) of all cases were grouped into this cluster.

Roughly 30% of the patients in cluster 3 were admitted to the hospital as emergencies. Their age and comorbidity level were almost at the sample's average, while interdisciplinary treatment and resource use in terms of DRG cost weight and LOS were several standard deviations above the

⁴ The elbow method was applied to determine the optimal value for k based on the within-cluster sum of squares (WCSS). A visual analysis in Appendix 5 shows a distinct bend ("elbow") at k = 5, after which additional clusters only marginally decrease the WCSS.

sample mean. They had a very high ICU utilization of roughly 20% and relatively high raw inpatient mortality rate of roughly 4%. Therefore, we named this cluster *Majority elective cases with above average complexity*. Overall, 6% (~133,000) of all cases were grouped into this cluster.

Table 4. Z-Score Standardized Values of Numerical Variables, 2019 and 2022

Variable	C1: Emergency cases with average complexity	C2: Elective cases with below average complexity	C3: Majority elective cases with above average complexity	C4: Majority emergency cases with above average complexity	C5: Elective and emergency cases with below average complexity
Age	0.66	0.40	0.12	0.77	-1.26
Elixhauser Index	-0.13	-0.35	0.16	1.90	-0.52
LOS	-0.16	-0.27	2.31	0.19	-0.33
DRG cost weight	-0.21	-0.11	1.94	0.17	-0.29
Interdisciplinary treatment	-0.33	-0.24	2.47	-0.04	-0.33
Intensive care unit stay dummy	0.08	0.03	0.20	0.14	0.04
Inpatient death dummy	0.02	0.00	0.04	0.08	0.00
Emergency admission dummy	1.00	0.00	0.30	0.60	0.44
Share and absolute number of cases	19% (425'878)	31% (703'172)	6% (133'355)	15% (337'809)	29% (668'294)

Annotations: C = Cluster. Dummies are not z-standardized. Z-standardization rescales variables to mean 0 and standard deviation 1. A z-score indicates how many standard deviations a value is from the mean: 0 means average, values between -1 and 1 are near the average, negative values are below the average, and positive values are above the average. Data years 2019 and 2022 were pooled for this analysis.

Roughly 60% of the patients in cluster 4 were admitted to the hospital as emergencies. Their age was slightly above the sample's average, and interdisciplinary treatment and resource use in terms of DRG cost weight and LOS were close to the average. Their comorbidity level is almost two standard deviations above the sample mean, and they had a fairly high ICU utilization of roughly 14% and a very high raw inpatient mortality rate of roughly 8%. We named this cluster *Majority emergency cases with above average complexity*. Overall, 15% (~338,000) of all cases were grouped into this cluster.

Roughly 44% of the patients in cluster 5 were admitted to the hospital as emergencies. Their comorbidity level, interdisciplinary treatment and resource use in terms of DRG cost weight and LOS were all slightly to considerably below the sample average, and their age was more than one standard deviation below the mean. They had a fairly low ICU utilization of roughly 4% and a

raw inpatient mortality rate of roughly 0%. We named this cluster *Elective and emergency cases with below average complexity*. Overall, 29% (~668,000) of all cases were grouped into this cluster.

In Table 5, we present the distribution of patient clusters across each of the eleven exemplary SPLGs. The results show that BEW7.2, TPL1, and GEB1 are homogenous in terms of complexity and urgency. For instance, all cases of TPL1 are part of cluster 3 (*Majority elective cases with above average complexity*). For the other SPLGs, patients' complexity and urgency vary, in some cases quite considerably. For instance, 30% of cases part of the BP are emergency cases with average complexity, while 28% are elective and emergency cases with below average complexity. The other three patient clusters also mark non-negligible shares of the BP. This indicates that while some procedures and diagnoses part of the BP might not fit into any specific SPLG, patients' heterogeneity in terms of complexity and urgency might create difficult challenges for care planning. NCH1 and VIS1 are two more examples for very heterogeneous SPLGs, potentially creating challenges for care planning.

Table 5. Cluster distribution per SPLG , 2019 and 2022

SPLG	Sample size	C1: Emergency cases with average complexity	C2: Elective cases with below average complexity	C3: Majority elective cases with above average complexity.	C4: Majority emergency cases with above average complexity	C5: Elective and emergency cases with below average complexity
BP	899,100	30%	17%	9%	16%	28%
HNO1	27,400	10%	17%	2%	7%	64%
BEW7.2	44,000	1%	95%	0%	3%	1%
NCH1	11,000	12%	31%	11%	28%	18%
NEU3	42,500	44%	9%	12%	30%	5%
NEU3.1	2,500	11%	6%	17%	64%	2%
TPL1	78	0%	0%	100%	0%	0%
VIS1	36,900	12%	37%	11%	27%	13%
GEB1	176,000	0%	1%	0.0%	0.0%	99%
BEW8	51,900	9%	68%	4%	7%	12%
BEW8.1	6,500	4%	56%	15%	7%	18%

Annotations: Basic package for surgery and internal medicine (BP), Primary Knee Replacement (BEW7.2), Ear-Nose-Throat Surgery (HNO1), Cerebrovascular Disorders (NEU3), Severe Stroke (NEU3.1), Cranial Neurosurgery (NCH1), Heart Transplantation (TPL1), Spine Surgery (BEW8), Complex Spine Surgery (BEW8.1), Basic Obstetric Care (GEB1), Visceral Surgery (VIS1). TPL 1 and NEU3.1 are part of the IVHSM. Percentages are rounded to full numbers and sample sizes to the closest hundred (exception: TPL1). Bold values mark the cluster with the highest share of cases within each SPLG. Data years 2019 and 2022 were pooled for this analysis.

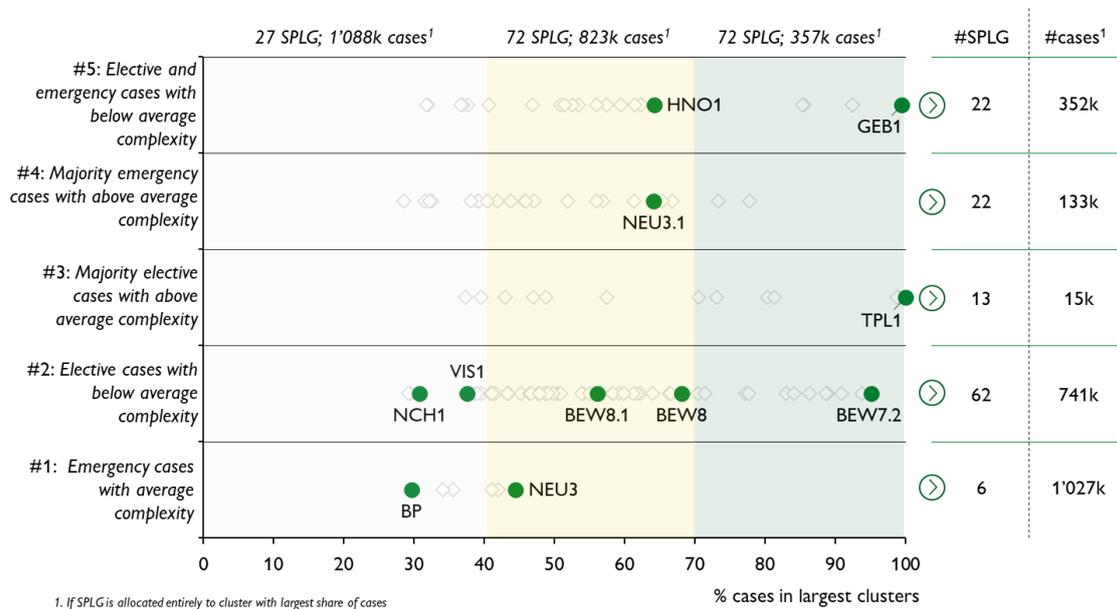
In Figure 7, we map all SPLGs to the cluster that contains the most cases of an SPLG, highlighting the eleven exemplary SPLGs as green dots. For GEB1, BEW7.2 and TPL1, this mapping is clear as patients in these SPLGs predominately belong to the same patient cluster. The same is true for 69

other SPLGs with case volume shares of more than 70% in the largest patient cluster, representing roughly 357,000 cases.

For another 72 SPLGs, representing roughly 823,000 cases, the largest patient cluster contains 40% to 70% of all cases. Four of our eleven exemplary SPLGs, namely HNO1, NEU3.1, BEW8, and BEW8.1, are part of these SPLGs. For these SPLGs, patients' complexity and urgency levels are fairly heterogeneous.

The final 27 SPLGs, representing more than one million cases, the largest patient cluster contains less than 40%. Within this group, the BP and NCH1 are among the SPLGs with the lowest shares of cases in the same patient cluster. For these SPLGs, patient heterogeneity is remarkably high, potentially posing challenges for planners that are difficult to address.

Figure 7. Mapping of SPLGs and Patient Clusters



Annotations: This figure shows the allocation of all SPLG to the different clusters based on the largest share of cases in respective clusters. Green dots highlight the eleven exemplary SPLGs. 100% means that all cases within an SPLG are grouped into one cluster. The green background indicates that for these SPLGs more than 70% of cases fall into the patient cluster defining the SPLG's cluster mapping. The yellow background indicates case volume shares between 40% and 70% and the white background below 40%. Data years 2019 and 2022 were pooled for this analysis.

In Table 6, we indicate what regional planning level should be defined for each of the five patient clusters, and what type of hospitals should receive service mandates for each patient cluster. SPLGs for which patients fall predominately in the same cluster, assignment to a regional planning level may follow the mapping in Table 6. For the remaining SPLGs, mapping to regional planning levels is more challenging, requiring deeper analysis of an SPLG's patients and/ or a new definition of the SPLG to enable better reachability of the three goals of care planning.

Table 6. Mapping of Patient Clusters and Regional Planning Levels

Clusters	C3	C2	C4	C1 and C5
Regional planning level	Nationwide	Inter-cantonal	One Canton	Several Communities
Planning authority level	Federal	Networks of cantons (multiple cantons)	Cantonal	Cantonal
Hospital types	Very few, highly specialized hospitals, concentrating rare and complex procedures	Shared supra-cantonal centers, with advanced infrastructure and subspecialized services	General or cantonal hospitals providing a broad range of care within one canton	Community hospitals, focused on basic emergency care and elective procedures of low complexity

Annotations: C1: Emergency cases with average complexity. C2: Elective cases with below average complexity. C3: Majority elective cases with above average complexity. C4: Majority emergency cases with above average complexity. C5: Elective and emergency cases with below average complexity. *Regional planning levels* denote the geographic and *planning authority levels* the administrative dimension of care planning.

3.3 Research Question 3: Future priorities for care planning

Stakeholder Dialogue

During the stakeholder dialogue five common themes and future directions emerged:

- (1) **Patient migration is influenced by geographic, topographic, and linguistic factors as well as urgency of medical services – and all of these factors need to be considered.** When discussing our initial analyses of patient out-of-canton migration for BP, BEW7.2 and NEU3 (cf. Figures 2 to 4), stakeholders agreed with and were not surprised by the findings that patient movement is significantly influenced by geographic, topographic, and linguistic factors. Moreover, it was mentioned that workplace location and the type of medical service is likely to shape travel patterns. Elective procedures such as knee replacement surgery show less dependence on geographic proximity, whereas emergency services require shorter travel times and closer geographic access. A former cantonal health policymaker stated: *“For elective services, people can travel easily and plan ahead. For services more deeply rooted in the community, geographic distance and relationships with local doctors and healthcare networks become significantly more important.”* Underutilization of services of hospitals on cantonal lists can have multiple reasons – interpretation of findings is to be taken with care. When presented with the analyses of Cantonal Service Mandate Portfolios, which revealed that for some cantons only a small share of hospitals on the cantonal lists provide 80 or 90% of care (e.g., NEU3, HNO1), stakeholders acknowledged these patterns but were skeptical about its interpretations. A former cantonal health director accounted this problem to the execution power by cantons and especially by larger cantons (e.g., due to legal appeals by hospital): *“[...] this is an issue that all larger cantons have [...]”*. Another participant mentioned that it can be attributed to

referral structures and small private hospitals. Results could also be explained by a high number of affiliated physicians (consultants) performing surgeries.

- (2) **There is a need to define clear national health objectives to formulate directions and a legal framework for (inter)-cantonal care planning.** When discussing the ideal model for planning in Switzerland, according to one stakeholder, a fundamental challenge is that national health objectives are absent (*"In public health matters, we have no objective and consequently we are incapable of defining an organization, resources, responsibilities to work toward this objective."*), and that *"a legitimate intermediate level between cantons and federal government"* is missing. Moreover, in the absence of clear national directions, cantonal *"self-interest comes first, economically and financially"*. A stakeholder involved in inter-cantonal planning relativized some of the statements by pointing towards the possibility of administrative agreements between cantons, which can make negotiations between unequal partners difficult (e.g., size).
- (3) **Cantons should create the framework conditions for care planning (e.g., inter-sectoral needs of care assessment) – but should give hospitals the autonomy and opportunity to transform themselves (bottom-up).** A cantonal hospital CEO emphasized that the core challenges involve advancing outpatient care, addressing digital transformation, and strategically repositioning hospitals to ensure continued service provision for Swiss citizens. *"Stop with inpatient planning. [...] And don't do hospital planning but give hospitals the chance to transform themselves."* The cantonal regulator's role is to create optimal institutional conditions for hospital development – and support hospitals in repositioning instead of enforcing rigid planning rules. A health insurance stakeholder stressed that *"The system moves much faster than political decisions. And what strongly concerns us today is how to accompany the system with smart political decisions."* Furthermore, regulators could use accessible quality information and health literacy initiatives to empower patient choice and stimulate systemic improvement, for instance, through comprehensible public reporting.
- (4) **Do not only focus on inter-cantonal care planning but consider inter-sectoral care planning. EFAS could be a chance to move towards inter-sectoral care planning – and a shift towards a continued shift from inpatient to outpatient care.** Financial incentives present a strong lever for change. Specific models, such as offering providers financial incentives for outpatient procedures, demonstrate how tariff structures can support shifting care from inpatient to outpatient settings (e.g., Region Biel: *"We made this model together with HSK [Helsana, Sanitas und KPT], where we said, the canton for every case [...] Every case that is not inpatient, you get [...] 45% of the inpatient DRG"*). The hospital-insurer partnerships and the upcoming (EFAS) reforms can facilitate changes to how outpatient and inpatient payments are connected.

In conclusion, the discussion clearly showed that inter-cantonal and inter-sectoral care planning is complex and characterized by numerous structural, political and practical barriers. While barriers exist, nearly all stakeholders present at the dialogue agreed on the goal to improve the system by, yet with slightly different priorities. While several bottom-up initiatives have been launched, a cantonal health department stakeholder pointed out that changes to the hospital planning approach are planned by the Conference of Cantonal Health Directors (GDK) which partly address the concerns from the discussion (see below).

Current developments in Swiss care planning

The discussed topics from the stakeholder dialogues are not completely novel. Inter-cantonal care planning approaches were implemented top-down by some cantons such as AI, AR, SG (population ~600,000). Recently, it was announced that TG will join the inter-cantonal planning group of AI, AR, and SG (population of all four cantons ~900,000) (Canton of St. Gallen, 2024; Canton of St.Gallen, 2025; Canton of Thurgau, 2018). The cantons of BL and BS (population ~600,000) are another example of a top-down intercantonal planning initiative (Canton of Basel-Stadt, 2023).

More recently, within the Réseau Bleu (Spitalzentrum Biel, 2025), five hospitals started to collaborate (bottom-up inter-cantonal care planning) in an inter-cantonal network to centralize specialized care and improve overall care provision and quality within the greater Biel/ Bienne region (population ~1,000,000).

Moreover, the GDK has announced a three-phase plan to further expand cross-cantonal cooperation with the aim of concentrating specialized hospital services (GDK, 2025). The three-phase plan comprises (1) a nationwide need for care analysis every five years and a nationwide need for care forecast every ten years, (2) a division of SPLGs into basic care and specialist care, and (3) uniform quality requirements for SPLGs in specialist care across all cantons.

Furthermore, a recent report by PwC (mandated by H+) stresses the importance of a better coordinated care planning between cantons to address the shortage of the medical workforce and the rising healthcare expenditures (PwC, 2025). Their recommendations are in line with our findings – and point towards (a) decoupling care planning from cantonal self-interests (e.g., economic, regional politics) and implement an intercantonal coordinated healthcare planning that is need for care oriented and supports cooperation, (b) facilitating bottom-up initiatives by e.g., deregulating competition or data protection laws, and (c) enabling patients to choose their hospital more freely by removing barriers for cross-cantonal migration (e.g., by price harmonization).

Whether these approaches and initiatives will lead to more concentration of specialized care, better quality and a better cost structure will have to be evaluated in a couple of years.

4 Discussion

4.1 Summary of findings

Research Question 1: Alignment of planning and empirical evidence

Our analyses of patient migration, cross-cantonal movement, and patient travel times reveal that care planning limited to canton borders does not align with real-world patient flows – even for more “basic” services as included in the BP. This finding was especially relevant for border regions and for BEW7.2 comprising elective, quality-of-life targeted services.

Moreover, our analysis of service mandate utilization of seven neighboring cantons provides evidence for the building of hypotheses as to what cantons could increase efficiency of service provision for what SPLGs. For instance, for HNO1 and BEW7.2, there might be service mandate redundancies within and across the cantons of BE and VD. If and why such redundancies might exist should be subject of further analysis and inter-cantonal communication and collaboration.

Ultimately, with the patient migration analysis (Figure 1) and the cantonal service mandate utilization analysis (Figure 6), we hope to provide an approach for cantons to identify regions where and SPLGs for which inter-cantonal coordination could be beneficial.

Research Question 2: Allocation of SPLGs to regional planning levels

Clustering of patients revealed that there are 27 SPLGs (48% of the total case volume of 2019 and 2022) which are very heterogeneous in terms of the urgency of their treatment and the complexity of the provided services and patients’ risk factors.

We acknowledge that it is challenging to revise SPLG definitions to increase the homogeneity of services in terms of urgency and complexity. To make an example: Experts might agree that an appendectomy generally is a surgery that is moderately urgent with below average complexity. For most patients, the treated appendicitis will not have progressed too strongly, and the appendectomy will be complication-free. But for a non-negligible share of patients, not only the appendix but also parts of the colon will be inflamed and/ or the appendix has ruptured before hospital admission, potentially causing an inflammation of the peritoneum. This marks a major risk for the patient, increasing urgency and complexity. This dynamic is reflected in the [Swiss Diagnosis-related Group \(DRG\) catalogue](#) that lists five DRGs for appendectomy, G22E to G22A, with a cost-weight range between 0.618 and 2.312, an indicator of the difference in complexity.

Answering the question if all procedures “appendectomy” and many other similar examples should be part of the same SPLG, is beyond the scope of this study, not least because this is a

medical question. Ultimately, the goal of our analysis is to provide an impulse and methodological guidance for how to detect which SPLGs might require revision.

For an additional 72 SPLGs (36% of the total case volume of 2019 and 2022), heterogeneity was also considerable. For these SPLGs, reaching all three levels of care planning is very challenging, regardless of the planning region they are assigned to.

The patients of the remaining 72 SPLGs (16% of total case volume of 2019 and 2022) could predominantly be grouped into one urgency-complexity cluster, making an assignment to a regional planning level clearer.

Research Question 3: Future priorities for care planning

The stakeholder dialogue revealed five central themes. First, patient migration is strongly shaped by geographic, topographic, linguistic, and service-related factors. Elective procedures allow for greater travel flexibility, while emergency care requires close geographic access. This is in line with our approach for the allocation of SPLGs to regional planning levels. Second, stakeholders cautioned against overinterpreting apparent underutilization of service mandates on cantonal service lists, noting that referral patterns, smaller private providers, and cantonal governance constraints can explain these findings. We concur with these concerns and – as outlined above – see the analysis primarily as a tool for triggering more detailed root-cause analyses and for identifying potential areas for inter-cantonal cooperation. Third, participants emphasized the absence of clear national care planning objectives, which hinders coherent (inter-) cantonal care planning and leaves cantonal self-interests dominant, despite existing evidence that cooperation can be beneficial. Fourth, stakeholders stressed that cantons should establish enabling framework conditions – such as inter-sectoral needs assessments – while granting hospitals autonomy to transform themselves in response to outpatient shifts, digitalization, and strategic repositioning. Finally, financial incentives and the upcoming EFAS reform were identified as key levers for promoting inter-sectoral rather than solely inter-cantonal planning, particularly in supporting shifts from inpatient to outpatient care.

Recent developments include both top-down and bottom-up inter-cantonal and inter-sectoral initiatives, including inter-cantonal planning groups (e.g., AI, AR, SG and most recently TG; BL and BS), hospital networks such as Réseau Bleu, and a three-phase GDK plan aiming to harmonize need for care assessments and quality requirements nationwide. Whether these efforts will ultimately improve coordination, and quality of care, while supporting the containment of costs of care without curbing access to care, remains to be evaluated in the coming years.

4.2 Limitations

This study has several limitations. First, outpatient records are missing, which restricts the analysis to inpatient care and prevents a full assessment of inter-sectoral care patterns. Second, hospital locations cannot be identified in the dataset. This makes insightful travel time analyses impossible. For instance, it is commonly analyzed how many patients bypass their closest and second closest hospital in order to descriptively understand travel patterns and build hypotheses for patients' provider choice and cross-border patient flows (Kuklinski et al., 2021, 2023). Third, the SPLG definitions and coding practices may differ slightly across years and cantons, which could introduce classification inconsistencies despite the cleaning steps and coding validation. Fourth, the study relies on administrative discharge data, which capture utilization but not unmet needs, patient preferences, or clinical appropriateness of care. Fifth, the analysis is based on two time points (2019 and 2022) and mainly focuses on 2022. Thus, longer-term trends or potential differences between several years are not captured in the analyses.

4.3 Future research

Future work should incorporate outpatient data, enabling a more comprehensive assessment of inter-sectoral planning. Assessing outpatient need for care is difficult even if claims data could be used, however. For instance, one major issue is that diagnoses are not recorded in a structured manner in outpatient settings. Moreover, hospital procedures and diagnoses are not recorded in claims data, rendering inter-sectoral need for care assessment with claims data alone infeasible. Yet linking claims data and hospital administrative data at the case level creates data privacy challenges.

Analyzing exact hospital locations or would improve travel-time analyses. Combined with quality indicators, patients' provider choice could be analyzed precisely. It would then also be possible to study patients' willingness to travel for higher-quality services, as well as to investigate if and how strongly geographic and topographic factors influence patient migration.

5 Policy Recommendations

Based on our findings, we derived the following recommendations as impulses for the future refinement of Swiss hospital capacity planning (or rather care planning in general):

(I) Cantons should coordinate their service mandate assignments across a variety of SPLGs.

To define which cantons should coordinate their activities in which regions, empirical patient movement – especially in border regions – and overlapping current service mandate assignments should be analyzed. These analyses have to be done separately per SPLG.

- (II) The size of a SPLG's planning region should be defined according to the complexity and urgency of the grouped services.

Care planning for larger regions comprising areas of two or more cantons or even larger parts of the country is not reserved to services part of IVHSM but could also comprise elective services of medium complexity.

- (III) The SPLG catalogue should be refined to define patient groups that are homogenous in terms of complexity and urgency.

SPLGs are defined to cluster medically homogenous services. While medical homogeneity should be preserved, refining SPLG definitions to group homogeneous services in terms of complexity and urgency will better support the care planning goals of ensuring access to and high quality of care while containing costs.

- (IV) Political momentum to integrate care planning, to define standardized quality requirements, and to redistribute planning and monitoring tasks should be seized.

The EFAS referendum has initiated an intensive yet productive and definitive development process. In this process, there is an opportunity to align interests and foster coordination not only across cantons but also between cantons and insurers. Thereby cross-sectional need for care analysis and care planning particularly because of ambulatory potential is of utmost importance.

Together the findings and recommendations of this report can inform the recently initiated process of the GDK on cross-cantonal collaboration as well as recent advances in selected regions (e.g. SG, AI, AR, and TG).

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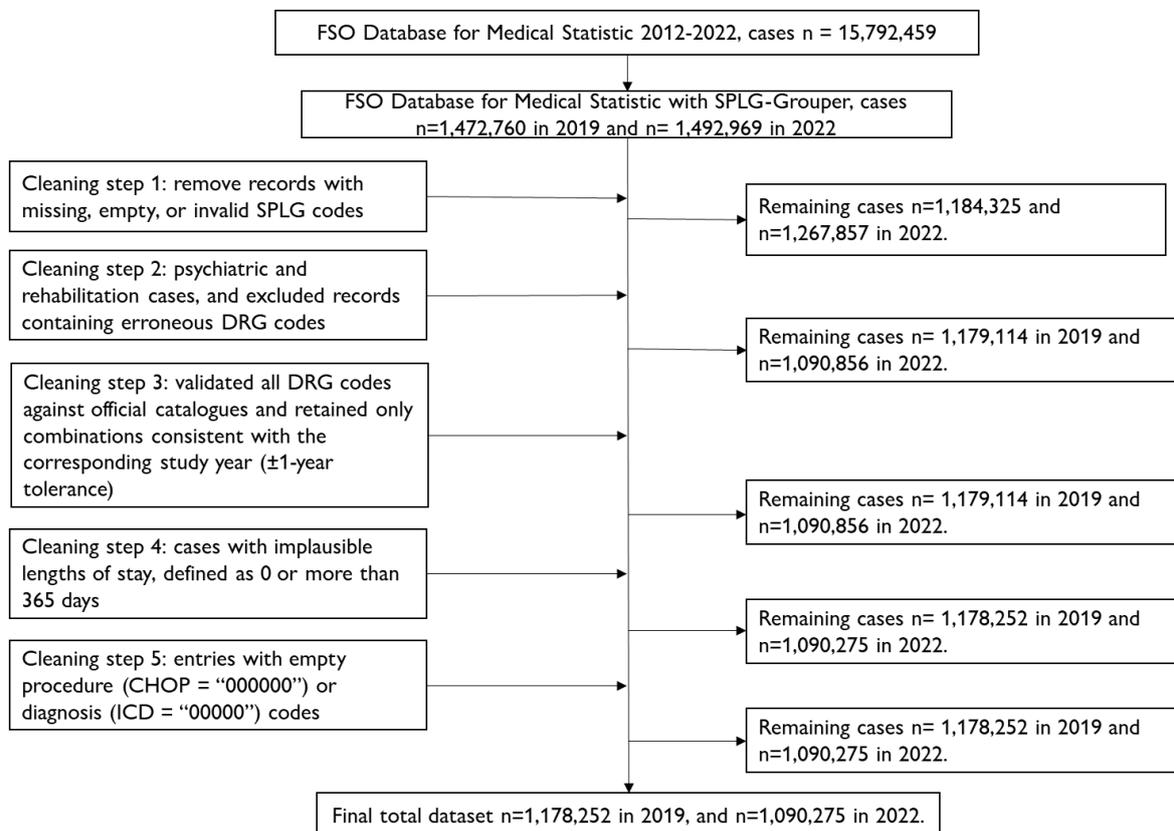
List of abbreviations

AI	Appenzell Innerrhoden
AR	Appenzell Ausserrhoden
BE	Bern
BEW7.2	Primary knee replacement
BEW8	Spine surgery
BEW8.1	Complex spine surgery
FSO	Federal Statistical Office
BP	Basic package for surgery and internal medicine
CHOP	Swiss Classification of Surgical Procedures
DRG	Diagnosis-Related Group
EFAS	Einheitliche Finanzierung von ambulanten und stationären Leistungen (English: Uniform Financing of Outpatient and Inpatient Services)
FR	Fribourg
GDP	Gross Domestic Product
GE	Geneva
GEB1	Basic obstetric care (from 34 weeks of pregnancy and \geq 2000g)
HCPM	Hospital Capacity Planning Model
HNO1	Ear–Nose–Throat Surgery
ICD-10-GM	10th revision of the International Statistical Classification of Diseases and Related Health Problems – German Modification
ICU	Intensive Care Unit
IVHSM	Interkantonale Vereinbarung im Bereich der hochspezialisierten Medizin (English: Highly Specialized Medicine)
JU	Jura
LOS	Length of Stay
NCH1	Specialised neurosurgery
NE	Neuchâtel
NEU3	Cerebrovascular disorders (without stroke unit)
NEU3.1	Complex treatment of strokes
SG	St. Gallen
SPLB	Spitalplanungs-Leistungsbereiche (English: Hospital Planning Service Areas)

SPLG	Spitalplanungs-Leistungsgruppen (English: Hospital Planning Service Groups)
TPL1	Heart transplantation
VD	Vaud
VIS1	Visceral surgery
VS	Valais

Appendices

Appendix 1. Flow chart of the data cleaning process



Annotations: Results from analyses with 2019 data are available upon request.

Appendix 2. Number of removed hospitals per SPLG and canton for the analysis of cantonal service mandate portfolio overlaps, 2022

Canton	SPLG	Included number of hospitals	Removed number of hospitals (>2.5% cumulative case volume share)
BE	BEW7.2	14	0
BE	HNO1	11	3
BE	NCH1	2	4
BE	NEU3	13	1
BE	NEU3.1	1	0
BE	TPL1	1	0

FR	BEW7.2	2	0
FR	HNO1	3	0
FR	NCH1	1	1
FR	NEU3	1	0

GE	BEW7.2	5	0
GE	HNO1	4	2
GE	NCH1	2	3
GE	NEU3	3	2
GE	NEU3.1	1	0

JU	BEW7.2	1	0
JU	HNO1	1	0
JU	NEU3	1	0

NE	BEW7.2	2	1
NE	HNO1	1	0
NE	NEU3	1	0

VD	BEW7.2	14	1
VD	HNO1	10	5
VD	NCH1	3	5
VD	NEU3	7	6
VD	NEU3.1	1	0
VD	TPL1	1	0

VS	BEW7.2	4	0
VS	HNO1	3	0
VS	NCH1	1	0
VS	NEU3	2	0

Annotations: Bern (BE), Fribourg (FR), Geneva (GE), Jura (JU), Neuchâtel (NE), Vaud (VD), Valais (VS). Primary knee replacement (BEW7.2), Ear–Nose–Throat Surgery (HNO1), Specialized neurosurgery (NCH1), Cerebrovascular disorders (without stroke unit) (NEU3), Complex treatment of strokes (NEU3.1), Heart transplantation (TPL1). TPL 1 and NEU3.1 are part of the IVHSM.

Appendix 3. Pre-survey for the stakeholder dialogue

We are conducting this short survey to gather expert insights on hospital capacity planning in acute inpatient care in Switzerland. Your responses will help us better arrange and tailor the upcoming stakeholder dialogue.

Q1: Which option best describes your language preference for the stakeholder dialogue?(answer with multiple choice)

- I prefer to speak in German, and I can understand French and English
- I prefer to speak in French, and I can understand German and English
- I am equally comfortable in German, French, and English
- Other (please specify):_____

Q2: In your opinion, can hospital capacity planning contribute to improving hospital quality in Switzerland? (answer with text entry)

Q3: In your opinion, what are the main barriers to inter-cantonal hospital capacity planning in Switzerland? (answer with text entry)

Q4: Please introduce yourself in 2–3 sentences, including your name. This information will be used for the introductions. (answer with text entry)

Appendix 4. Guidelines for moderators in the stakeholder dialogue

Overarching questions:

- (1) Should alternative planning areas or regions be considered for different service groups?*
- (2) Under what conditions would cantons engage in inter-cantonal planning for selected services?*
- (3) What role should need-for-care analyses play in capacity planning, particularly for larger areas?*

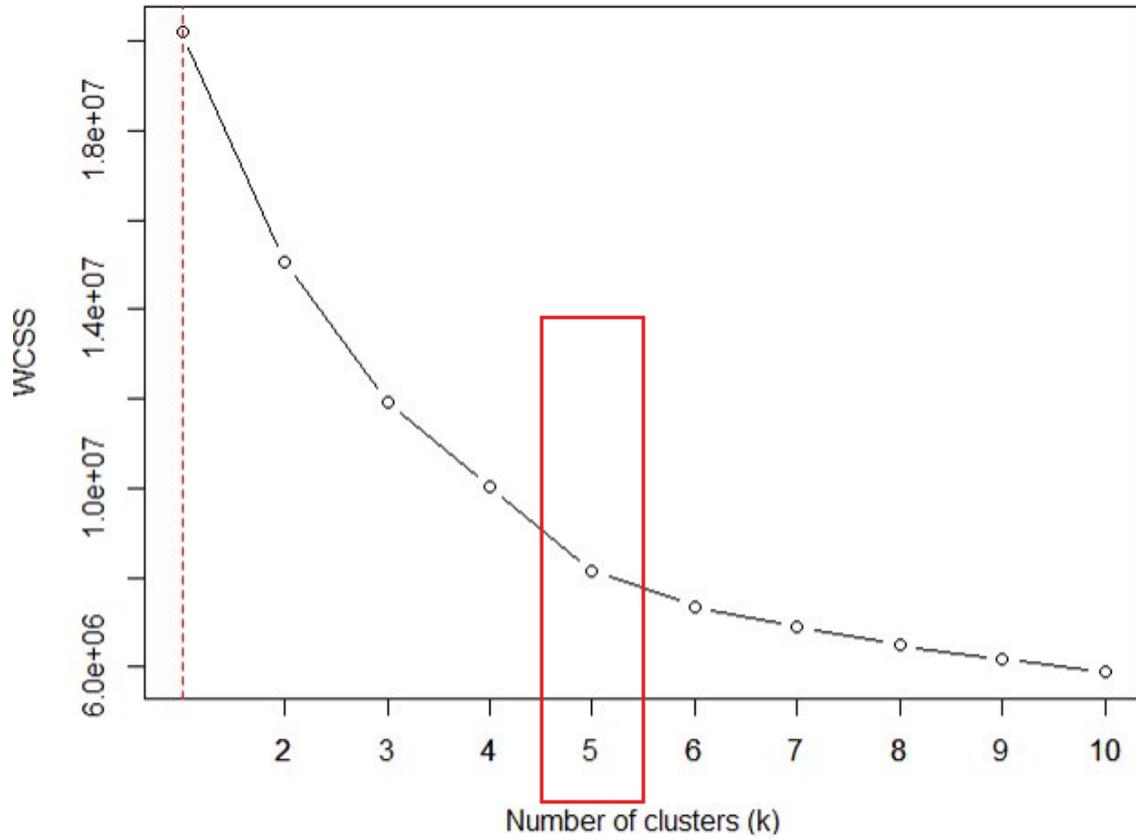
Discussion Session I: Is inter-cantonal hospital capacity planning an effective tool for shaping the hospital landscape?

- (1) How do you define/understand inter-cantonal planning? Should it be considered? What defines a region?
- (2) Should alternative planning areas or regions be considered for different service groups? And if yes, which?
- (3) Which factors should determine the planning level of service groups? (urgency, specialization, patient flow, etc)
- (4) Planning of inpatient services can contribute to better quality (by concentrating medical care). What other services, besides IVHSM, do you consider to be “specialized medical services”? And why? Which services have the potential to be planned across cantons?
- (5) What services may not be classified as “specialized medical care”, but could be replaced by ambulatory and outpatient care?
- (6) What “need for care” should be considered in the context of inpatient care? What role should need for care analyses play in capacity planning, particularly with regard to larger areas, patient flow, time, and language?

Discussion Session II: Road to implementation- opportunities and barriers

- (1) What are the largest barriers for implementation of inter-cantonal planning?
- (2) How could they be addressed? Are there alternative models?
- (3) How to address regional economic and political restrictions and factors (e.g., tax income, jobs, etc.)?
- (4) Which conditions need to be given that cantons engage in inter-cantonal planning?
- (5) What are your policy recommendations of solutions to enhance the coordination on the inter-cantonal planning?

Appendix 5. Optimal Number of Clusters k (Elbow Method)



Annotations: We used the elbow method to identify the optimal value of k, as determined by the within-cluster sum of squares (WCSS). As visible in the plot, there is a distinct bend (“elbow”) at k = 5, after which the WCSS decreases only marginally with additional clusters.

List of supplements

All supplements are available as separate files:

A: Exact case volumes of MedStat regions with cross-canton migration shares

Supplement A: Cross-canton migration shares above thresholds of 25% in BP, BEW7.2, and NEU3, 2022

Supplementary Material

Title: The Future of Swiss Hospital Capacity Planning - New impulses from real-world evidence and stakeholder inputs

Authors: Vogel, Justus; Fu, Enqi; Lang, Charlotte; Ehlig, David; Geissler, Alexander

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Supplement A. Cross-canton migration shares above thresholds of 25%

a. SPLG: BP - MedStat areas with outflows above 25% (129 MedStat areas)							
Canton	MedStat	Total Cases	Outflow - overall	Largest outflow	to canton	Second-largest outflow	to canton
AG	AG43	426	56%	82%	ZH	6%	GR
AG	AG49	561	54%	52%	ZG	30%	LU
AG	AG40	554	54%	92%	ZH	2%	GR
AG	AG50	447	51%	64%	BS	31%	BL
AG	AG01	401	44%	77%	SO	7%	ZH
AG	AG51	690	40%	76%	BS	14%	BL
AG	AG52	567	39%	73%	BS	21%	BL
AG	AG42	685	34%	81%	ZH	4%	GR
AG	AG53	487	33%	69%	BS	21%	BL
AG	AG38	530	32%	92%	ZH	4%	BE
AG	AG54	417	29%	64%	BS	17%	BL
AG	AG06	534	25%	49%	BE	31%	SO
AI	AI01	78	100%	81%	SG	17%	AR
AI	AI02	610	100%	50%	SG	45%	AR
AR	AR01	427	82%	95%	SG	1%	GR
AR	AR05	422	79%	97%	SG	2%	ZH
AR	AR02	467	57%	93%	SG	4%	GR
AR	AR03	380	46%	92%	SG	2%	BL
AR	AR04	761	37%	91%	SG	4%	TG
BE	BE49	537	35%	78%	SO	10%	AG
BE	BE95	387	28%	91%	SO	3%	ZH
BL	BL06	1527	80%	96%	BS	1%	AG
BL	BL12	831	75%	52%	SO	44%	BS
BL	BL07	781	72%	96%	BS	1%	SO
BL	BL11	787	69%	52%	SO	45%	BS
BL	BL13	1432	67%	54%	BS	42%	SO
BL	BL02	516	63%	51%	BS	43%	SO
BL	BL03	949	60%	92%	BS	2%	AG
BL	BL01	698	58%	53%	BS	41%	SO
BL	BL08	1054	54%	88%	BS	3%	SO
BL	BL10	739	54%	65%	BS	28%	SO
BL	BL05	1132	53%	75%	BS	20%	SO
BL	BL04	987	51%	89%	BS	3%	SO
BL	BL19	385	44%	52%	BS	37%	AG
BL	BL09	1010	38%	87%	BS	6%	AG
BL	BL21	244	32%	68%	BS	12%	AG
BL	BL15	746	31%	80%	BS	10%	AG
BL	BL22	296	30%	77%	BS	7%	AG
BL	BL23	555	30%	71%	BS	9%	AG
BL	BL20	484	29%	76%	BS	7%	SO
BL	BL18	700	28%	90%	BS	7%	AG
BL	BL16	805	28%	84%	BS	3%	ZH
BL	BL17	380	26%	78%	BS	5%	AG
BL	BL14	247	26%	84%	BS	3%	AG
BS	BS09	345	33%	81%	BL	6%	GR
FR	FR20	294	85%	94%	BE	1%	SO
FR	FR27	389	80%	96%	VD	2%	BE
FR	FR28	454	78%	95%	VD	3%	BE
FR	FR15	448	77%	96%	BE	1%	BS
FR	FR29	578	69%	88%	VD	8%	BE
FR	FR18	207	57%	63%	BE	18%	VD
FR	FR19	315	53%	95%	BE	2%	VD

FR	FR21	435	52%	86%	BE	5%	VD
FR	FR16	507	49%	93%	BE	3%	VD
FR	FR25	220	45%	91%	VD	3%	BE
FR	FR14	392	40%	94%	BE	3%	VS
FR	FR24	454	30%	92%	VD	3%	GE
FR	FR22	366	29%	88%	VD	8%	BE
FR	FR13	408	25%	92%	BE	2%	VD
GL	GL06	59	53%	52%	SG	23%	GR
GL	GL03	391	32%	32%	GR	26%	ZH
GL	GL02	547	26%	47%	GR	19%	ZH
GR	GR26	403	99%	96%	TI	2%	ZH
JU	JU01	470	63%	71%	BE	17%	NE
LU	LU36	158	63%	70%	BE	17%	AG
LU	LU33	185	46%	89%	BE	2%	AG
LU	LU19	238	45%	75%	AG	14%	ZH
LU	LU35	536	34%	82%	AG	5%	BE
LU	LU24	281	33%	60%	AG	9%	ZG
LU	LU34	284	32%	55%	SZ	15%	ZG
LU	LU29	286	31%	79%	BE	7%	AG
NE	NE09	468	26%	78%	BE	11%	VD
NW	NW01	531	33%	74%	LU	5%	ZH
NW	NW04	204	26%	74%	LU	8%	OW
OW	OW05	163	99%	72%	NW	14%	LU
OW	OW01	284	36%	62%	LU	19%	NW
OW	OW03	450	27%	60%	LU	22%	NW
OW	OW04	231	26%	70%	LU	5%	BE
OW	OW02	413	25%	60%	LU	15%	NW
SG	SG30	1249	56%	84%	ZH	8%	SZ
SG	SG24	559	51%	92%	GR	5%	ZH
SG	SG25	660	38%	86%	GR	7%	ZH
SG	SG27	449	34%	48%	GR	37%	GL
SG	SG33	286	30%	85%	AR	5%	TG
SG	SG26	387	27%	90%	GR	6%	ZH
SH	SH08	78	95%	97%	ZH	1%	GR
SH	SH07	319	38%	52%	TG	37%	ZH
SO	SO03	565	77%	52%	BS	44%	BL
SO	SO05	943	63%	52%	BL	42%	BS
SO	SO06	419	63%	87%	AG	3%	BS
SO	SO04	771	61%	54%	BL	41%	BS
SO	SO14	637	52%	88%	AG	3%	ZH
SO	SO10	654	31%	42%	BE	37%	AG
SO	SO09	585	30%	47%	AG	29%	BE
SO	SO18	336	30%	82%	BE	4%	BS
SO	SO12	481	30%	66%	AG	12%	BE
SO	SO24	437	27%	90%	BE	3%	AG
SO	SO13	436	27%	72%	AG	11%	BS
SO	SO01	945	26%	86%	BE	4%	ZH
SO	SO02	261	25%	86%	BE	5%	ZH
SO	SO16	267	25%	43%	BE	25%	AG
SZ	SZ01	544	64%	70%	LU	17%	ZG
SZ	SZ12	693	42%	83%	ZH	3%	GR
SZ	SZ11	572	40%	81%	ZH	4%	LU
SZ	SZ15	567	33%	60%	ZH	29%	SG
SZ	SZ02	557	31%	42%	LU	37%	ZG
SZ	SZ13	766	26%	77%	ZH	6%	SG
TG	TG13	364	59%	62%	SH	32%	ZH
TG	TG02	666	58%	85%	SG	8%	ZH

TG	TG24	1013	55%	91%	SG	4%	AR
TG	TG22	453	42%	93%	SG	3%	GR
TG	TG01	451	39%	55%	SG	38%	ZH
TG	TG03	405	36%	79%	SG	12%	ZH
TG	TG04	551	30%	70%	SG	20%	ZH
TG	TG23	456	30%	85%	SG	7%	ZH
UR	UR01	242	31%	47%	LU	38%	NW
UR	UR05	107	27%	41%	ZH	38%	LU
VD	VD01	466	44%	56%	FR	29%	BE
VD	VD31	573	27%	95%	GE	2%	BL
VS	VS34	410	87%	99%	VD	1%	FR
VS	VS33	333	85%	95%	VD	2%	GE
VS	VS30	494	84%	97%	VD	1%	BE
VS	VS32	777	81%	97%	VD	1%	GE
VS	VS31	321	60%	96%	VD	4%	GE
VS	VS29	256	28%	64%	VD	26%	GE
ZG	ZG07	833	26%	55%	LU	25%	ZH
ZH	ZH81	391	69%	90%	SH	3%	TG
ZH	ZH38	644	41%	79%	ZG	8%	LU
ZH	ZH84	276	26%	66%	TG	17%	SH

b. SPLG: BEW7.2 - MedStat areas with outflows above 25% (228 MedStat areas)

Canton	MedStat	Total Cases	Outflow - overall	Largest outflow	to canton	Second-largest outflow	to canton
AG	AG49	37	73%	56%	ZG	37%	LU
AG	AG50	31	71%	73%	BS	27%	BL
AG	AG52	28	68%	74%	BS	26%	BL
AG	AG38	27	67%	94%	ZH	6%	TG
AG	AG40	44	64%	93%	ZH	4%	BE
AG	AG53	31	61%	79%	BS	16%	BL
AG	AG43	27	59%	75%	ZH	12%	ZG
AG	AG51	58	55%	53%	BS	44%	BL
AG	AG42	56	46%	96%	ZH	4%	ZG
AG	AG24	22	36%	75%	ZH	12%	BL
AG	AG35	14	36%	100%	ZH	-	-
AG	AG54	30	33%	60%	BS	30%	BL
AG	AG04	46	33%	47%	OW	20%	ZH
AG	AG27	23	30%	86%	ZH	14%	SZ
AG	AG55	33	30%	60%	BS	10%	BE
AG	AG06	37	30%	45%	BE	27%	ZH
AG	AG32	21	29%	83%	ZH	17%	ZG
AG	AG37	32	28%	100%	ZH	-	-
AG	AG48	28	25%	43%	ZG	43%	ZH
AI	AI01	12	100%	75%	AR	25%	SG
AI	AI02	46	100%	85%	AR	15%	SG
BE	BE46	35	37%	54%	SO	23%	AG
BE	BE49	42	33%	86%	SO	14%	BL
BE	BE95	36	33%	100%	SO	-	-
BE	BE43	40	25%	40%	BL	40%	JU
BL	BL06	88	80%	99%	BS	1%	SO
BL	BL21	13	69%	78%	BS	11%	AG
BL	BL03	54	67%	89%	BS	11%	SO
BL	BL07	28	64%	94%	BS	6%	ZH
BL	BL23	33	61%	85%	BS	10%	SO
BL	BL10	40	52%	76%	BS	24%	SO
BL	BL09	44	52%	78%	BS	13%	AG
BL	BL04	60	50%	97%	BS	3%	AG
BL	BL08	53	49%	92%	BS	4%	AG
BL	BL18	48	48%	87%	BS	9%	AG
BL	BL15	42	48%	75%	BS	15%	AG
BL	BL17	37	46%	82%	BS	6%	AG
BL	BL22	24	46%	100%	BS	-	-
BL	BL13	73	44%	75%	BS	25%	SO
BL	BL16	43	42%	67%	BS	17%	AG
BL	BL19	26	38%	90%	BS	10%	AG
BL	BL12	49	37%	50%	SO	44%	BS
BL	BL02	33	36%	92%	BS	8%	SO
BL	BL05	58	36%	95%	BS	5%	SO
BL	BL11	37	35%	69%	SO	23%	BS
BL	BL14	15	33%	80%	BS	20%	AG
BL	BL20	26	27%	57%	BS	29%	SO
BS	BS03	45	33%	87%	BL	7%	SO
BS	BS09	22	27%	83%	BL	17%	ZH
FR	FR20	27	100%	96%	BE	4%	NE
FR	FR21	30	97%	100%	BE	-	-
FR	FR15	46	89%	100%	BE	-	-
FR	FR16	37	70%	96%	BE	4%	ZH
FR	FR28	30	70%	95%	VD	5%	BE

FR	FR08	9	67%	83%	VD	17%	BE
FR	FR19	30	63%	95%	BE	5%	ZH
FR	FR14	32	62%	100%	BE	-	-
FR	FR18	15	60%	89%	BE	11%	NE
FR	FR27	20	55%	100%	VD	-	-
FR	FR13	33	55%	100%	BE	-	-
FR	FR25	22	55%	92%	VD	8%	BS
FR	FR24	36	53%	95%	VD	5%	BE
FR	FR17	14	50%	71%	BE	14%	NE
FR	FR22	22	36%	100%	VD	-	-
FR	FR11	41	32%	85%	VD	15%	BE
FR	FR29	36	31%	91%	VD	9%	NE
GE	GE04	7	29%	100%	VD	-	-
GE	GE29	22	27%	100%	VD	-	-
GL	GL06	4	75%	33%	SG	33%	SO
GL	GL05	14	36%	60%	ZH	20%	LU
GL	GL04	30	33%	40%	SZ	40%	ZH
GL	GL03	19	32%	67%	ZH	17%	SG
GL	GL01	36	31%	55%	ZH	18%	SZ
GL	GL02	37	27%	30%	GR	30%	SZ
GR	GR26	21	100%	86%	TI	5%	BE
GR	GR17	19	26%	60%	ZH	40%	AR
JU	JU01	32	47%	40%	BE	20%	BS
JU	JU07	25	44%	64%	BL	18%	BS
JU	JU04	34	26%	67%	BL	33%	BE
LU	LU34	28	50%	43%	ZG	36%	SZ
LU	LU35	40	50%	80%	AG	20%	OW
LU	LU36	7	43%	67%	BE	33%	AG
LU	LU12	31	39%	75%	ZG	17%	ZH
LU	LU13	31	39%	50%	ZG	25%	ZH
LU	LU19	16	38%	100%	AG	-	-
LU	LU33	11	36%	100%	BE	-	-
LU	LU24	20	35%	29%	AG	14%	NW
LU	LU16	18	28%	20%	BL	20%	OW
LU	LU20	22	27%	50%	ZH	33%	AG
LU	LU15	31	26%	88%	NW	12%	OW
NE	NE10	15	33%	60%	BE	20%	VD
NE	NE05	35	29%	70%	VD	20%	GE
NE	NE14	14	29%	75%	BE	25%	VD
NE	NE09	32	28%	78%	BE	22%	VD
NE	NE02	47	28%	77%	VD	15%	BE
NE	NE08	36	25%	89%	BE	11%	VD
NW	NW01	23	39%	22%	LU	22%	OW
OW	OW05	14	100%	79%	NW	14%	ZH
OW	OW04	30	30%	56%	LU	22%	BE
OW	OW01	20	25%	60%	NW	20%	LU
SG	SG15	19	95%	100%	AR	-	-
SG	SG33	22	91%	90%	AR	5%	GL
SG	SG18	51	90%	100%	AR	-	-
SG	SG14	42	88%	97%	AR	3%	ZH
SG	SG16	46	87%	100%	AR	-	-
SG	SG38	14	86%	92%	AR	8%	SZ
SG	SG06	33	85%	96%	AR	4%	TG
SG	SG10	30	83%	96%	AR	4%	SZ
SG	SG39	24	83%	95%	AR	5%	ZH
SG	SG08	47	83%	90%	AR	10%	ZH
SG	SG37	34	82%	86%	AR	14%	ZH

SG	SG11	36	81%	93%	AR	7%	TG
SG	SG17	38	79%	97%	AR	3%	ZG
SG	SG05	28	79%	100%	AR	-	-
SG	SG09	41	78%	94%	AR	6%	ZH
SG	SG02	36	78%	100%	AR	-	-
SG	SG42	22	77%	88%	AR	12%	ZH
SG	SG40	64	75%	85%	AR	6%	ZH
SG	SG13	46	74%	91%	AR	6%	TG
SG	SG07	49	73%	92%	AR	6%	TG
SG	SG41	22	73%	88%	AR	12%	ZH
SG	SG12	31	71%	95%	AR	5%	ZH
SG	SG35	34	71%	88%	AR	4%	SZ
SG	SG01	63	70%	98%	AR	2%	LU
SG	SG24	44	68%	83%	GR	13%	ZH
SG	SG03	30	67%	95%	AR	5%	ZH
SG	SG04	20	65%	100%	AR	-	-
SG	SG30	55	64%	80%	ZH	14%	SZ
SG	SG20	44	61%	96%	AR	4%	GR
SG	SG19	58	59%	85%	AR	9%	ZH
SG	SG27	26	58%	60%	GR	27%	ZH
SG	SG25	57	54%	84%	GR	10%	AR
SG	SG36	43	53%	78%	AR	9%	ZH
SG	SG34	20	45%	67%	AR	11%	SZ
SG	SG22	83	43%	92%	GR	8%	AR
SG	SG32	31	42%	46%	ZH	31%	AR
SG	SG23	22	36%	62%	GR	38%	AR
SG	SG26	36	36%	77%	GR	15%	ZH
SG	SG21	34	35%	50%	AR	50%	GR
SG	SG31	38	34%	62%	ZH	23%	SZ
SG	SG29	36	33%	75%	ZH	17%	AR
SG	SG28	20	25%	100%	ZH	-	-
SH	SH08	7	57%	100%	ZH	-	-
SO	SO03	32	94%	70%	BL	30%	BS
SO	SO05	54	89%	88%	BL	12%	BS
SO	SO06	31	81%	80%	AG	8%	BS
SO	SO04	37	68%	60%	BL	40%	BS
SO	SO09	42	57%	38%	AG	29%	BE
SO	SO14	40	55%	91%	AG	5%	BL
SO	SO12	30	43%	100%	AG	-	-
SO	SO02	19	42%	88%	BE	12%	AG
SO	SO18	36	42%	87%	BE	7%	BL
SO	SO13	25	40%	80%	AG	10%	BS
SO	SO24	34	38%	85%	BE	8%	AG
SO	SO07	42	38%	69%	AG	19%	ZH
SO	SO19	32	38%	67%	BE	17%	BL
SO	SO01	66	36%	83%	BE	8%	BL
SO	SO21	20	35%	86%	BE	14%	ZG
SO	SO11	27	33%	56%	AG	33%	ZH
SO	SO16	28	32%	33%	BS	22%	AG
SO	SO08	35	31%	73%	AG	9%	BE
SO	SO17	48	31%	80%	BE	13%	AG
SO	SO20	40	28%	45%	BE	18%	ZH
SO	SO15	27	26%	57%	BE	29%	BS
SO	SO10	51	25%	31%	AG	23%	BE
SZ	SZ01	32	75%	54%	ZG	25%	LU
SZ	SZ02	36	50%	67%	ZG	17%	LU
SZ	SZ11	29	48%	93%	ZH	7%	BL

SZ	SZ06	30	40%	25%	BL	25%	ZG
SZ	SZ12	43	40%	88%	ZH	6%	BL
SZ	SZ03	15	27%	50%	ZG	25%	BS
TG	TG22	26	77%	75%	AR	10%	SG
TG	TG02	37	76%	75%	AR	14%	SG
TG	TG24	55	71%	72%	AR	23%	SG
TG	TG01	34	68%	70%	AR	17%	ZH
TG	TG13	31	61%	79%	SH	21%	ZH
TG	TG04	33	55%	67%	AR	33%	ZH
TG	TG19	52	50%	100%	AR	-	-
TG	TG05	34	47%	88%	ZH	6%	AR
TG	TG03	21	43%	67%	AR	22%	ZH
TG	TG23	29	41%	100%	AR	-	-
TG	TG20	27	41%	91%	AR	9%	ZH
TG	TG09	24	38%	78%	AR	22%	ZH
TG	TG21	37	35%	85%	AR	8%	SG
TG	TG14	29	34%	50%	SH	50%	ZH
TG	TG18	25	32%	62%	ZH	38%	AR
TG	TG15	37	30%	73%	ZH	18%	SG
TG	TG07	30	27%	75%	ZH	25%	AR
TI	TI05	19	37%	100%	LU	-	-
UR	UR05	8	75%	33%	ZH	17%	GR
UR	UR02	44	43%	47%	SZ	42%	ZH
UR	UR03	32	41%	54%	SZ	23%	LU
VD	VD01	28	61%	53%	FR	47%	BE
VD	VD31	30	47%	86%	GE	7%	BE
VD	VD41	24	33%	75%	VS	12%	BE
VD	VD28	26	27%	86%	GE	14%	ZH
VS	VS34	30	67%	90%	VD	10%	BE
VS	VS31	15	53%	100%	VD	-	-
VS	VS32	62	52%	88%	VD	6%	FR
VS	VS30	34	50%	100%	VD	-	-
VS	VS33	28	50%	100%	VD	-	-
VS	VS15	25	48%	33%	VD	25%	BE
VS	VS07	17	47%	75%	BE	12%	VD
VS	VS03	17	41%	86%	BE	14%	BS
VS	VS02	47	38%	94%	BE	6%	ZH
VS	VS01	25	32%	75%	BE	25%	GE
VS	VS10	29	31%	100%	BE	-	-
VS	VS25	23	30%	86%	VD	14%	ZH
VS	VS04	43	28%	83%	BE	8%	AG
VS	VS29	27	26%	43%	BE	29%	GE
ZG	ZG06	13	46%	83%	ZH	17%	LU
ZG	ZG05	35	34%	67%	ZH	17%	SZ
ZG	ZG01	53	28%	73%	ZH	13%	LU
ZG	ZG07	40	25%	70%	ZH	20%	SZ
ZH	ZH81	33	67%	100%	SH	-	-
ZH	ZH38	26	58%	93%	ZG	7%	BE
ZH	ZH67	30	40%	83%	SG	17%	SZ
ZH	ZH70	8	38%	67%	TG	33%	SH
ZH	ZH61	41	37%	93%	SG	7%	SZ
ZH	ZH60	33	33%	100%	SG	-	-
ZH	ZH57	37	32%	58%	SG	17%	SH
ZH	ZH83	22	32%	100%	SH	-	-
ZH	ZH37	32	31%	100%	ZG	-	-
ZH	ZH63	69	28%	79%	SG	11%	SZ
ZH	ZH36	55	27%	100%	ZG	-	-

ZH	ZH79	44	27%	67%	SH	25%	TG
ZH	ZH44	35	26%	89%	SZ	11%	GR
ZH	ZH84	24	25%	100%	SH	-	-

c. SPLG: NEU3 - MedStat areas with outflows above 25% (146 MedStat areas)

Canton	MedStat	Total Cases	Outflow - overall	Largest outflow	to canton	Second-largest outflow	to canton
AG	AG51	29	90%	92%	BS	4%	BL
AG	AG52	33	85%	89%	BS	7%	BL
AG	AG50	24	83%	95%	BS	5%	SO
AG	AG53	25	64%	94%	BS	6%	ZH
AG	AG40	35	60%	95%	ZH	5%	OW
AG	AG54	22	45%	100%	BS	-	-
AG	AG43	18	44%	100%	ZH	-	-
AG	AG49	22	41%	78%	LU	11%	SG
AG	AG38	21	33%	100%	ZH	-	-
AI	AI01	1	100%	100%	SG	-	-
AI	AI02	37	100%	76%	SG	22%	AR
AR	AR05	18	94%	100%	SG	-	-
AR	AR02	29	90%	92%	SG	4%	BE
AR	AR01	22	86%	100%	SG	-	-
AR	AR03	14	86%	100%	SG	-	-
AR	AR04	30	80%	96%	SG	4%	GR
BE	BE49	22	36%	88%	SO	12%	BL
BE	BE95	26	27%	100%	SO	-	-
BE	BE46	12	25%	100%	SO	-	-
BL	BL06	76	97%	96%	BS	1%	AG
BL	BL12	28	89%	84%	BS	16%	SO
BL	BL10	33	88%	90%	BS	10%	SO
BL	BL02	16	88%	64%	BS	36%	SO
BL	BL03	40	88%	97%	BS	3%	AG
BL	BL13	70	86%	88%	BS	7%	SO
BL	BL07	43	84%	97%	BS	3%	VS
BL	BL14	11	82%	89%	BS	11%	LU
BL	BL11	27	81%	73%	BS	23%	SO
BL	BL01	26	81%	90%	BS	10%	SO
BL	BL04	47	77%	94%	BS	3%	AG
BL	BL05	63	75%	91%	BS	4%	SO
BL	BL08	50	72%	97%	BS	3%	SG
BL	BL18	37	68%	96%	BS	4%	VS
BL	BL23	33	67%	91%	BS	9%	AG
BL	BL20	24	62%	80%	BS	7%	AG
BL	BL21	8	62%	80%	BS	20%	SO
BL	BL09	35	57%	90%	BS	5%	BE
BL	BL17	21	57%	92%	BS	8%	ZH
BL	BL15	29	55%	88%	BS	6%	BE
BL	BL22	17	53%	89%	BS	11%	ZH
BL	BL19	14	50%	86%	BS	14%	AG
BL	BL16	40	48%	100%	BS	-	-
BS	BS09	17	35%	83%	BL	17%	GR
FR	FR20	10	90%	100%	BE	-	-
FR	FR15	29	83%	100%	BE	-	-
FR	FR16	15	73%	100%	BE	-	-
FR	FR27	28	64%	83%	VD	11%	BE
FR	FR18	10	60%	83%	BE	17%	VD
FR	FR21	21	57%	92%	BE	8%	VD
FR	FR28	21	57%	92%	VD	8%	LU
FR	FR19	23	52%	100%	BE	-	-
FR	FR29	26	46%	67%	VD	25%	BE
FR	FR25	9	44%	50%	VD	50%	VS
FR	FR13	24	38%	78%	BE	11%	TI

FR	FR22	19	32%	50%	BE	33%	VD
FR	FR14	17	29%	100%	BE	-	-
FR	FR24	17	29%	60%	VD	20%	BE
GL	GL06	5	40%	50%	GR	50%	SG
GL	GL05	16	31%	100%	ZH	-	-
GR	GR26	21	100%	100%	TI	-	-
GR	GR24	5	40%	100%	TI	-	-
GR	GR21	8	38%	67%	SG	33%	TG
GR	GR10	7	29%	50%	AG	50%	SG
GR	GR12	16	25%	50%	SG	25%	AG
JU	JU01	36	81%	72%	BE	17%	BS
JU	JU07	22	55%	92%	BS	8%	BE
JU	JU02	57	53%	90%	BS	7%	BE
JU	JU03	26	50%	100%	BS	-	-
JU	JU04	29	45%	100%	BS	-	-
JU	JU08	23	43%	100%	BS	-	-
JU	JU06	14	29%	100%	BS	-	-
JU	JU05	12	25%	100%	BS	-	-
LU	LU33	9	44%	75%	BE	25%	OW
LU	LU36	8	38%	67%	BE	33%	AG
LU	LU19	19	37%	71%	AG	14%	NW
LU	LU34	25	32%	38%	ZH	25%	SZ
LU	LU17	7	29%	100%	AG	-	-
LU	LU35	22	27%	83%	AG	17%	BE
NW	NW01	28	57%	81%	LU	6%	OW
NW	NW03	38	37%	86%	LU	7%	BE
NW	NW02	36	28%	100%	LU	-	-
NW	NW04	11	27%	100%	LU	-	-
OW	OW05	8	100%	50%	LU	50%	NW
OW	OW04	14	57%	88%	LU	12%	NW
OW	OW02	16	50%	75%	LU	12%	NW
OW	OW01	13	46%	100%	LU	-	-
OW	OW03	24	42%	80%	LU	10%	GR
SG	SG30	58	66%	89%	ZH	5%	SZ
SG	SG32	4	50%	50%	GL	50%	ZH
SG	SG28	24	42%	80%	ZH	10%	SZ
SG	SG29	20	35%	57%	ZH	14%	GR
SG	SG24	33	33%	100%	GR	-	-
SG	SG31	18	28%	80%	GL	20%	ZH
SH	SH08	5	100%	100%	ZH	-	-
SH	SH07	16	31%	80%	ZH	20%	GR
SH	SH06	14	29%	50%	ZH	25%	GR
SH	SH05	26	27%	100%	ZH	-	-
SO	SO06	19	95%	100%	AG	-	-
SO	SO03	28	89%	88%	BS	12%	BL
SO	SO04	38	87%	61%	BS	27%	BL
SO	SO05	42	83%	83%	BS	14%	BL
SO	SO14	23	70%	100%	AG	-	-
SO	SO13	31	61%	89%	AG	5%	BL
SO	SO12	21	57%	83%	AG	8%	SH
SO	SO02	16	38%	67%	BE	17%	BL
SO	SO16	9	33%	67%	AG	33%	BE
SO	SO23	27	33%	67%	BE	22%	BS
SO	SO10	31	29%	56%	AG	33%	BE
SO	SO07	38	29%	82%	AG	9%	BE
SZ	SZ01	23	74%	65%	LU	18%	ZG
SZ	SZ12	39	67%	88%	ZH	8%	GR

SZ	SZ11	19	53%	70%	ZH	10%	BE
SZ	SZ14	31	48%	67%	ZH	13%	GR
SZ	SZ09	17	47%	88%	ZH	12%	ZG
SZ	SZ07	13	46%	100%	ZH	-	-
SZ	SZ13	48	46%	95%	ZH	5%	SG
SZ	SZ08	25	44%	82%	ZH	9%	GR
SZ	SZ02	16	44%	43%	LU	29%	ZG
SZ	SZ15	24	38%	67%	ZH	11%	GL
SZ	SZ06	33	33%	55%	ZH	45%	LU
SZ	SZ10	3	33%	100%	ZH	-	-
TG	TG02	37	57%	100%	SG	-	-
TG	TG13	17	47%	62%	SH	25%	ZH
TG	TG24	45	47%	95%	SG	5%	AR
TG	TG03	16	38%	83%	SG	17%	ZH
TG	TG01	27	37%	50%	ZH	40%	SG
TG	TG04	43	28%	58%	SG	17%	ZH
UR	UR04	17	29%	100%	LU	-	-
UR	UR02	32	25%	88%	LU	12%	ZH
VD	VD01	12	50%	67%	FR	33%	BE
VD	VD64	22	45%	90%	FR	10%	TI
VS	VS34	19	79%	100%	VD	-	-
VS	VS32	36	72%	96%	VD	4%	TI
VS	VS33	15	53%	88%	VD	12%	TI
VS	VS30	25	48%	100%	VD	-	-
VS	VS15	20	30%	50%	BE	33%	VD
VS	VS29	19	26%	100%	VD	-	-
ZG	ZG07	40	45%	56%	LU	22%	AG
ZG	ZG02	38	32%	25%	AG	25%	LU
ZG	ZG04	26	31%	38%	AG	38%	ZH
ZG	ZG08	55	29%	31%	AG	25%	LU
ZG	ZG03	28	25%	43%	AG	43%	LU
ZG	ZG06	12	25%	67%	ZH	33%	LU
ZH	ZH81	22	77%	76%	SH	12%	TG
ZH	ZH38	28	36%	60%	ZG	20%	BE
ZH	ZH83	20	25%	80%	SH	20%	GR