

# **Regional Differences in the Management of Diverticulitis in Switzerland**

*Alexandre Pierre Cuérel*

**Master Thesis**

## **Thesis committee**

**Prof Dieter Hahnloser** *Tutor*

**Prof Gian Dorta** *Expert*

**Dr Seraina Faes** *Investigator Swiss Snapshot Diverticulitis Trial*

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## Summary

New treatment policies for colonic diverticulitis have enlarged therapeutic options, resulting in a low consensus of international guidelines for the management of this disease. Swiss national guidelines are missing. Switzerland is traditionally characterized by a linguistic diversity, resulting in multiple regional differences across language borders. The Swiss health care system is organized in a decentralized manner. Accordingly, the management of colonic diverticulitis in Switzerland is not well characterized, and differences across language regions are likely.

The Swiss Snapshot Diverticulitis study evaluates the current practice of in-hospital management of colonic diverticulitis in Switzerland over a time period of three months. A subanalysis studying the consensus of treatment of acute colonic diverticulitis across language areas constitutes the basis of this master thesis.

Over a time period of three months, 783 patients with acute colonic diverticulitis were treated in 74 Swiss hospitals. Treatment policies were significantly different across language areas with respect to diagnostic modalities, nutrition, intraoperative management of complicated diverticulitis, in particular the performance of a primary anastomosis or Hartmann's procedure and follow-up after hospital discharge. There was a consensus for conservative treatment approaches with no significant differences for the use of antibiotic regimens in patients with uncomplicated diverticulitis and the insertion of a percutaneous drainage in complicated diverticulitis patients.

The management of colonic diverticulitis features important regional differences across the Swiss language borders. National guidelines are necessary in order to uniform treatment approaches.

## Introduction

Switzerland is characterized by a high diversity and variety, and holds four official national languages. German is spoken by the majority of the Swiss population (63.5%), followed by French (22.5%), Italian (8.1%) and Romansh (0.5%) [1]. The linguistic diversity of Switzerland is a valuable cultural asset, but may represent a challenge for cross-border communication and coordination of official matters. The border between the German and French language area is called the „Röstigraben“ and features a particular line in the geography of Switzerland. In fact, Swiss language areas evolve to some extent independently, obtaining an important influence from the adjacent country with the same language. Many differences can be observed over the “Röstigraben”, examples are different folkways and traditions, different official television channels and newspapers, different political orientations, and a different educational system.

Organization of health care in Switzerland is decentralized. Apart from a few general aspects which are coordinated at a federal level, health care remains the responsibility of every individual Swiss area [2]. Despite a considerable effort striving to uniform the Swiss health care system over language regions, several studies suggested differences between one and the other side of these artificial borders. A significant difference in the management of diabetes patients in the German, French and Italian part of Switzerland with different use of oral antidiabetic drugs and insulin was described [3]. Considerable regional disparities were shown for the detection of breast cancer, and its surgical management such as the indication for mastectomy and use of sentinel node procedures [4]. Furthermore, a significant influence of the Swiss language region on the utilization and provision of health care resources was demonstrated [5]. Additional studies outlined inconsistencies in the Swiss health system depending on the density of physicians, hospital supply, per capita income, and rurality [6] [7].

The management of diverticulitis is at a particular risk for regional differences. Over the past years treatment of diverticulitis has changed lowering the need for acute and elective surgery. Furthermore, surgery is performed less invasive, and strives to preserve continuity. International guidelines on the management of diverticulitis display a low consensus, in particular concerning diagnostic modalities, the use of antibiotics, and the performance of Hartmann’s procedure [8]. A Swiss national guideline is missing.

The aim of the Swiss Snapshot Diverticulitis study was to evaluate the current practice of in-hospital management of colonic diverticulitis in Switzerland. This master thesis analyzes differences in the management of acute colonic diverticulitis across the Swiss language regions.

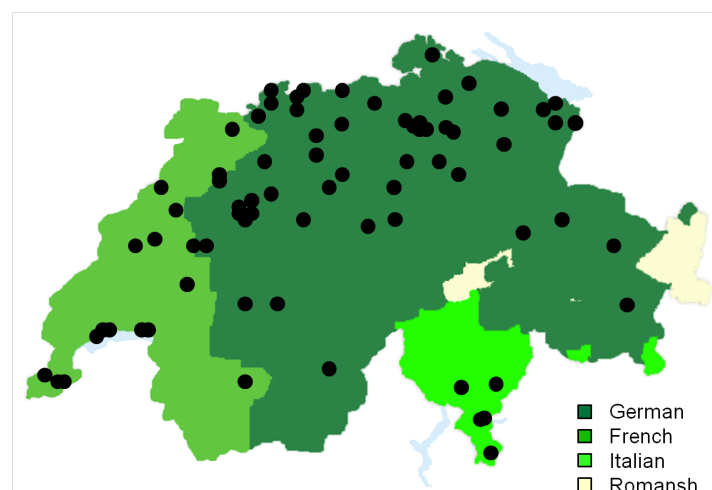
## Methods

This master's thesis is performed as part of the Swiss Snapshot Diverticulitis study, a prospective observational study evaluating the current practice of in-hospital management of colonic diverticulitis in Switzerland over a three months time period.

Swiss hospitals holding a surgical department were identified from annual reports of the Swiss Medical Association, the Swiss Surgical Society and the Association of Private Hospitals Switzerland. Study participation was requested by contacting corresponding chiefs of surgery of public hospitals and attending surgeons of private hospitals. Inclusion criteria were the presence of an acute colonic diverticulitis with emergency hospital admission or hospitalization for elective surgery for colonic diverticular disease, furthermore age over 18 years and a hospital stay superior to 24 hours. Patients undergoing out-patient treatment and minors under an age of 18 years were excluded. Study period was scheduled from May to July 2014, where patients admitted to the hospital between May 1<sup>st</sup> 2014 and July 31<sup>st</sup> 2014 were included independently of hospital discharge day. In-hospital management as well as one month out-patient follow-up were prospectively assessed by each participating centre using an ethically approved, anonymous questionnaire. All questionnaires were returned to the organizing center for evaluation. Questionnaires of patients with emergency admission for acute colonic diverticulitis were used for this master thesis, comparing the management of patients with respect to the Swiss language region. The study was considered as a quality control study and according to the ethical commission of the Canton Vaud did not require informed consent from the patients. All data was received in an anonymized form from the participating centers.

Depending on the language spoken by the majority of the population in the hospital catchment area, hospitals were allocated to the language groups "German", "French" or "Italian" (Figure 1). Due to the small sample size and overlapping with the German language area, no hospital was allocated to the Romansh language.

**Figure 1.** Allocation of Hospitals to Language Areas.



We assessed clinical parameters, mode of admission, length of hospital stay, management policy, diagnostic modalities including imaging findings, parameters of conservative and operative treatment, postoperative findings and follow-up (Table 1).

Data was entered into an Excel database and analysed using GraphPad Prism version 6.05. Proportions were compared using Chi-square test or Fisher's exact test as appropriate. Quantitative variables were analyzed using medians together with Kruskal-Wallis test for non-parametric variables and using means together with One-way ANOVA for parametric variables. P-values below 0.05 were considered significant.

**Table 1.** Study Parameters.

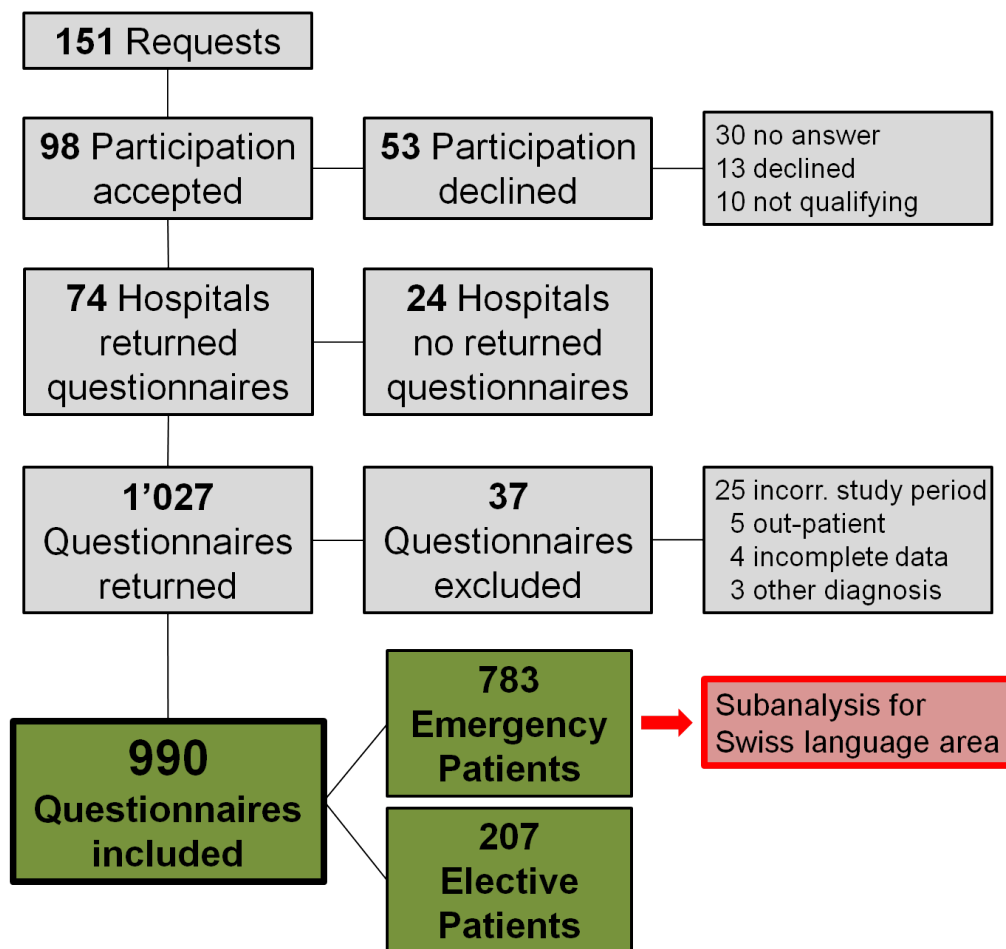
Clinical Parameters	Age Gender body mass index ASA score Charlson Index [9] Immunosuppression Previous abdominal surgery Onset of symptoms Previously diagnosed diverticulitis Previous colonoscopy
Mode of Admission	Elective Emergency
Hospital Stay	Length of hospital stay Length of ICU admission
Management Policy	Conservative treatment Operative treatment Failure rate of conservative treatment
Diagnostic Modalities	Laboratory findings (CPR, WBC, creatinine) CT scan Sonography X-ray
Imaging Findings	Localization of diverticula Ambrosetti CT classification of diverticulitis [10] [11] [12]
Conservative Treatment	Use of antibiotic regimens Insertion of percutaneous drainage Enteral and parenteral nutrition
Operative Treatment	Hinchey score [13] Operative procedure Performance of primary anastomosis Oncologic resection Surgical approach Operating time Estimated blood loss
Postoperative Course	Complication score Clavien-Dindo [14] [15] [16] In-hospital mortality Re-operation
Follow-up	Planned follow-up Planned colectomy Planned stoma reversal

ICU = intensive care unit; CRP = C - reactive protein; WBC = white blood cells count

## Results

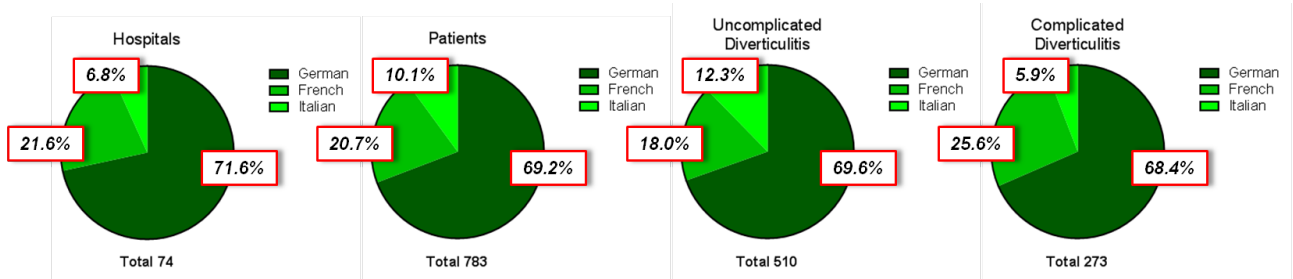
By analyzing reports of the Swiss Medical Association, the Swiss Surgical Society and the Association of Private Hospitals Switzerland, 151 Swiss hospitals with surgical departments were identified. All 151 hospitals were requested to participate in the Swiss Snapshot Diverticulitis Study, of these, 98 accepted participation and were provided with questionnaires. After study completion, 74 hospitals returned a total of 1'027 questionnaires, of which 990 satisfied inclusion criteria. Of these 990 questionnaires, 783 (79.1%) concerned patients admitted as emergency for acute colonic diverticulitis (Figure 2). These 783 patients were used for the subsequent analysis.

**Figure 2.** Flow Chart of Participation.



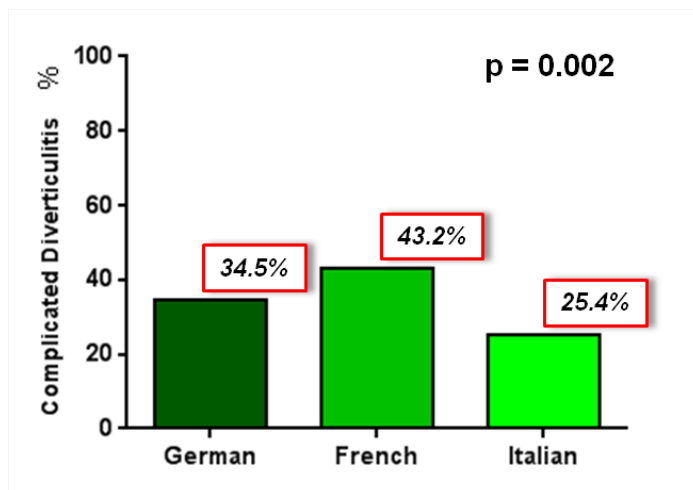
Depending on the language spoken by the majority of the population in the hospital catchment region, 53/74 (71.6%) hospitals were accorded to the German, 16/74 (21.6%) to the French and 5/74 (6.8%) to the Italian group. This resulted in a total number of 542/783 (69.2%) patients for the German, 162/783 (20.7%) for the French and 79/990 (10.1%) for the Italian region (Figure 3).

**Figure 3.** Distribution of Hospitals and Patients.



Uncomplicated diverticulitis was diagnosed in 510/783 (65.1%) and complicated diverticulitis in 273/783 (34.9%) patients. The rate of complicated diverticulitis was significantly different between language areas and ranged from 25.4% in the Italian to 43.2% in the French area ( $p=0.002$ , Figure 4).

**Figure 4.** Rate of complicated Diverticulitis.



Given the distinct difference in the management of uncomplicated and complicated diverticulitis, results are reported separately for these two entities.

### ***Uncomplicated Diverticulitis***

Patients with uncomplicated diverticulitis hospitalized in the Italian part of Switzerland were significantly older and had higher Charlson Index as compared to patients in the German and French part. Symptom onset prior to hospital admission was earlier in French speaking patients. Other clinical parameters did not differ significantly across language areas (Table 2).

**Table 2.** Clinical Parameters.

	<b>German</b>	<b>French</b>	<b>Italian</b>	<b>p-value</b>
<b>Age [years]</b> mean (SD)	60.8 (14.1)	62.9 (14.3)	65.5 (12.9)	<b>0.032</b>
<b>Gender</b> male [%]	43.7%	41.8%	44.4%	ns
<b>BMI [kg/m<sup>2</sup>]</b> median (range)	27.0 (18.7 - 48.7)	26.3 (17.8 - 41.0)	26.5 (19.1 - 37.6)	ns
<b>ASA score</b> 1-2 3-5	89.8% 10.2%	88.4% 11.6%	75.9% 24.1%	ns
<b>Charlson Index</b> 0-2 >2	93.4% 6.6%	94.6% 5.4%	81.0% 19.0%	<b>0.0021</b>
<b>Immunosuppression</b> [%]	3.1%	3.2%	3.2%	ns
<b>Previous abdominal surgery</b> [%]	49.3%	57.3%	52.4%	ns
<b>Previous episode of diverticulitis</b> [%]	42.2%	45.0%	56.6%	ns
<b>Onset of symptoms</b> >24h [%]	65.7%	80.0%	62.3%	<b>0.021</b>
<b>Previous colonoscopy</b> [%]	32.5%	24.6%	35.8%	ns

ns = not significant; BMI = body mass index

Diverticula were most frequently localized in the descending and sigmoid colon (92.9%). Diagnostic work-up with CT scan (mean 92.2%) and sonography (mean 19.2%) differed significantly between different language regions, with more CT scans performed in the French part and more sonographies performed in the German part. White blood cell counts were higher for patients in the French part of Switzerland. Length of hospital stay displayed no regional differences (Table 3).



**Table 3.** Hospital Stay and Diagnostic Work-up.

	German	French	Italian	p-values
<b>Localization of Diverticula</b> [%]				
ascending colon	3.7%	5.8%	6.7%	ns*
transverse colon	2.0%	1.2%	0.0%	
descending and/or sigmoid colon	93.1%	93.0%	91.6%	
multiple	1.2%	0.0%	1.7%	
<b>X-ray</b> [%]	10.4%	8.7%	19.0%	ns
<b>Sonography</b> [%]	22.3%	9.8%	15.9%	<b>0.020</b>
<b>CT Scan</b> [%]	89.9%	100.0%	93.7%	<b>0.0049</b>
<b>Laboratory findings median (range)</b>				
<b>WBC [tsd/<math>\mu</math>l]</b>	11.5 (3.4 - 27.3)	12.4 (9.8 - 24.0)	10.0 (3.8 - 23.5)	<b>0.001</b>
<b>CRP [mg/l]</b>	73 (0.9 - 331)	62 (8 - 428)	71 (2 - 266)	ns
<b>creatinine [<math>\mu</math>mol/l]</b>	74 (42 - 223)	74 (18 - 138)	75 (6 - 260)	ns
<b>Length of stay (days) median (range)</b>	4 (1 - 34)	4 (1 - 32)	4 (1 - 23)	ns

\* p-value with respect to descending/sigmoid versus other localization

Uncomplicated diverticulitis was treated with intravenous antibiotic regimens in 92.9% and peroral antibiotic regimens in 87.4% of patients without regional differences. Whilst patients in the Italian part of Switzerland had more parenteral nutrition, physicians in German speaking areas prescribed more enteral supplements and less frequently restricted diet to nothing per oral or liquids only for the first 24 hours of hospital stay (Table 4). Failure rate (mean 1.8%) and complication rate (mean 2.7%) of conservative treatment were low and did not vary across language regions (Table 4 and 5).

**Table 4.** Treatment of uncomplicated Diverticulitis.

	German	French	Italian	p-values
<b>Antibiotics i.v.</b> [%]	91.5%	97.8%	95.2%	ns
<b>Antibiotics p.o.</b> [%]	87.8%	87.9%	84.1%	ns
<b>Parenteral nutrition</b> [%]	2.0%	1.1%	9.5%	<b>&lt;0.0001</b>
<b>Enteral supplementation</b> [%]	8.6%	1.1%	4.8%	<b>0.031</b>
<b>Diet 24h *NPO or liquids</b> [%]	69.0%	80.0%	80.0%	<b>0.049</b>
<b>Diet 48h *NPO or liquids</b> [%]	32.3%	41.6%	26.8%	ns
<b>Failure Rate of Conservative Treatment</b> [%]	1.9%	2.2%	0.0%	ns

\*patients received NPO (nothing per oral) or liquids only for 24 or 48 hours respectively

**Table 5.** Complication Scores of uncomplicated Diverticulitis.

	<b>German</b>	<b>French</b>	<b>Italian</b>	<b>p-values</b>
<b>Complication scores</b> [%]				
Score 0	97.4%	96.1%	98.0%	
Score I	1.3%	2.6%	2.0%	
Score II	0.6%	1.3%	0.0%	
Score III	0.0%	0.0%	0.0%	
Score IV	0.3%	0.0%	0.0%	
Score V	0.3%	0.0%	0.0%	
<b>Complication scores</b> [%]				
Score 0	97.4%	96.1%	98.0%	ns
Score I - V	2.6%	3.9%	2.0%	

Out-patient follow-up and management after hospital discharge differed significantly between language areas, where patients in the German speaking region received the most follow-up appointments and highest rate of planned colectomy after uncomplicated diverticulitis (Table 6.)

**Table 6.** Follow-up.

	<b>German</b>	<b>French</b>	<b>Italian</b>	<b>p-values</b>
<b>Hospital Follow-up</b> [%]	54.2%	44.0%	38.1%	<b>0.025</b>
<b>Planned Colectomy</b> [%]	17.1%	12.5%	4.8%	<b>0.035</b>

### ***Complicated Diverticulitis***

Clinical parameters (Table 7) and laboratory findings (Table 8) of complicated diverticulitis patients were not significantly different between language areas. Patients in the Italian region had more X-rays. CT scan results with respect to Ambrosetti classification were not significantly different for language regions. Patients in the French part of Switzerland had significantly longer hospital stays (Table 8).

**Table 7.** Clinical Parameters.

	German	French	Italian	p-value
<b>Age [years]</b> mean (SD)	64.1 (14.4)	63.6 (14.9)	61.5 (13.8)	ns
<b>Gender</b> male [%]	48.1%	45.7%	37.5%	ns
<b>BMI [kg/m<sup>2</sup>]</b> median (range)	26.1 (19.5 - 47.4)	25.3 (14.7 - 39.1)	27.1 (22.0 - 31.2)	ns
<b>ASA score</b> 1-2 3-5	75.3% 24.7%	75.0% 25.0%	93.3% 6.7%	ns
<b>Charlson Index</b> 0-2 >2	89.7% 10.3%	82.9% 17.1%	100.0% 0.0%	ns
<b>Immunosuppression</b> [%]	8.6%	10.3%	6.3%	ns
<b>Previous abdominal surgery</b> [%]	42.5%	50.0%	68.8%	ns
<b>Previous episode of diverticulitis</b> [%]	44.8%	35.3%	53.3%	ns
<b>Onset of symptoms &gt;24h</b> [%]	80.9%	86.8%	75.0%	ns
<b>Previous colonoscopy</b> [%]	34.8%	22.2%	46.7%	ns

**Table 8.** Hospital Stay and Diagnostic Work-up.

	German	French	Italian	p-values
<b>Localization of Diverticula</b> [%]				
ascending colon	3.4%	1.1%	0.0%	
transverse colon	1.1%	0.0%	0.0%	
descending and/or sigmoid colon	95.5%	98.9%	100.0%	
multiple	0.0%	0.0%	0.0%	
<b>X-ray</b> [%]	11.2%	11.4%	37.5%	<b>0.0097</b>
<b>Sonography</b> [%]	11.2%	2.9%	12.5%	ns
<b>CT Scan</b> [%]	98.9%	100.0%	100.0%	
<b>Ambrosetti Classification</b>				ns
1 - 2	19.7%	10.4%	13.3%	
3 - 4	80.3%	89.6%	86.7%	
<b>Laboratory findings</b> median (range)				
WBC [tsd/ $\mu$ l]	12.6 (4.2 - 28.5)	12.3 (5.2 - 25.0)	14.0 (7.4 - 25.0)	ns
CRP [mg/l]	119 (1 - 460)	133 (2 - 469)	150 (19 - 402)	ns
creatinine [ $\mu$ mol/l]	78 (37 - 533)	78 (35 - 404)	74 (55 - 153)	ns
<b>Length of stay (days)</b> median (range)	7 (2 - 74)	10 (2 - 51)	6.5 (2 - 23)	<b>0.047</b>
<b>ICU stay <math>\geq</math> 1 day</b> [%]	16.0%	11.4%	0.0%	ns

Patients with complicated diverticulitis were treated conservatively in 74.5%, failure rate of conservative treatment was 18.1%. Surgery was performed in 39.1% of patients, of these, 65.4% had emergency surgery indicated at hospital admission, and 34.6% represent failure of conservative treatment. Management policies for the treatment of complicated diverticulitis did not significantly differ across language regions (Table 9).

**Table 9.** Management Policy of complicated Diverticulitis.

	<b>German</b>	<b>French</b>	<b>Italian</b>	<b>p-values</b>
<b>Conservative</b> [%]	74.5%	72.9%	81.3%	ns
<b>Failure rate of conservative treatment</b> [%]	17.9%	15.7%	30.8%	ns
<b>Operative*</b> [%]	38.8%	38.6%	43.8%	ns

\* group "operative treatment" includes patients with primary operation and patients with failure after conservative treatment

Patients in the Italian part of Switzerland had significantly more parenteral nutrition, and patients in the French part more frequently received nothing or only liquids per oral for the first 24 hours of hospital stay. Rate of percutaneous drain insertion did not differ across language regions (Table 10).

**Table 10.** Conservative Treatment of complicated Diverticulitis.

	<b>German</b>	<b>French</b>	<b>Italian</b>	<b>p-values</b>
<b>Antibiotics i.v.</b> [%]	92.9%	90.2%	92.3%	ns
<b>Antibiotics p.o.</b> [%]	79.3%	76.5%	76.9%	ns
<b>Parenteral nutrition</b> [%]	2.1%	3.9%	15.4%	<b>0.042</b>
<b>Enteral supplementation</b> [%]	6.4%	5.9%	7.7%	ns
<b>Diet 24h</b> *NPO or liquids [%]	72.9%	91.3%	72.7%	<b>0.034</b>
<b>Diet 48h</b> *NPO or liquids [%]	42.4%	34.8%	30.0%	ns
<b>Drain</b>	8.6%	9.8%	15.4%	ns
<b>Failure Rate Drain</b>	25.0%	40.0%	0.0%	ns**

\*patients received NPO (nothing per oral) or liquids only for 24 or 48 hours respectively

\*\* Fisher's exact test for "German" versus "French", no p-value calculated for "Italian" as value is zero

In the French part of Switzerland, Hinchey scores of III and IV were more frequent than in other parts of Switzerland. Patients received more Hartmann's procedures, had less primary anastomosis and less oncologic resections in hospitals of French speaking areas. If a stoma was installed, this was more frequently a Hartmann's stoma in the French region. Surgical approach by laparoscopy (44.4%, conversion rate 31.8%) or laparotomy (55.6%) was not significantly different for language regions. Surgeons in the French part of Switzerland had later graduation years from med school (Table 11).

**Table 11.** Operative Treatment of complicated Diverticulitis.

	German	French	Italian	p-values
<b>Hinchey score</b> [%]				
I - II	44.4%	8.0%	33.3%	<b>0.005</b>
III - IV	55.6%	92.0%	66.7%	
<b>Operative procedure</b> [%]				
Anastomosis without ileostomy	41.1%	7.4%	42.9%	<b>0.0011*</b>
Anastomosis with ileostomy	16.4%	3.7%	28.6%	
Hartmann's procedure	28.8%	63.0%	14.3%	
Lavage	6.8%	7.4%	14.3%	
Other	6.8%	18.5%	0.0%	
<b>Operative management</b> [%]				
primary anastomosis	66.7%	17.4%	83.3%	<b>&lt;0.0001</b>
oncologic resection	41.3%	9.5%	20.0%	
<b>Stoma formation</b> [%]				
protective ileostomy	36.4%	5.6%	66.7%	<b>0.0002</b>
Hartmann's procedure	63.6%	94.4%	33.3%	
<b>Laparoscopic/open resection</b> [%]				
laparoscopic	38.8%	52.0%	71.4%	ns
open	61.2%	48.0%	28.6%	ns
conversion rate	34.6%	30.8%	20.0%	ns
<b>Operating Time</b> [min] mean (SD)	198 (108)	179 (77)	152 (68)	ns
<b>Estimated Blood Loss</b> [ml] mean (SD)	206 (224)	263 (360)	188 (131)	ns
<b>Graduation Year of Surgeon</b> y (SD)	1994 (10)	2001 (5)	1993 (9)	<b>0.043</b>
<b>Teaching Operation</b> [%]	23.3%	30.4%	16.7%	ns
<b>Re-operation</b> [%]	16.4%	22.2%	14.3%	ns

\* Fisher's exact test for "German" versus "French", no p-value calculated for "Italian" as values are zero or too small

Overall complication rate was 23.7% and mortality rate 2.9% without significant differences across language areas (Table 12). Patients in the German part of Switzerland were more frequently planned for an elective colectomy after complicated diverticulitis treated conservatively or by lavage (Table 13).

**Table 12.** Complication Scores of complicated Diverticulitis.

	German	French	Italian	p-values
<b>Complication scores</b> [%]				
Score 0	77.7%	68.6%	93.8%	
Score I	6.4%	8.6%	0.0%	
Score II	5.9%	10.0%	0.0%	
Score III	6.9%	7.1%	6.3%	
Score IV	1.1%	0.0%	0.0%	
Score V	2.1%	5.7%	0.0%	
<b>Complication scores</b> [%]				
Score 0	77.7%	68.6%	93.8%	ns
Score I - V	22.3%	31.4%	6.3%	

**Table 13.** Follow-up.

	German	French	Italian	p-values
<b>Hospital Follow-up</b> [%]	72.8%	68.2%	93.8%	ns
<b>Planned Colectomy*</b> [%]	42.9%	22.2%	22.2%	<b>0.033</b>
<b>Stoma Reversal</b> [%]	58.6%	61.1%	75.0%	ns

\*planned colectomy for patients hospitalized for complicated diverticulitis and treated conservatively or by lavage

## Discussion

Clinical parameters differed only little between the three Swiss language areas. Of note, patients with uncomplicated diverticulitis in the Italian speaking part of Switzerland were older and had a higher Charlson Index. Possibly, hospitals in this region more frequently followed an out-patient strategy for healthy young patients. However, ASA score was not significantly differed between language areas, which would not support the hypothesis of a preferred out-patient treatment in the Italian part of Switzerland.

Analysis of diagnostic work-up revealed that all three language regions had a high use of CT scan of 90% or above. However, there was no consensus for the use of CT scan nor sonography. In the German part of Switzerland, 10.1% of patients were diagnosed without CT scan, whilst this was never the case in the French speaking part of Switzerland. On the other hand, 22.3% of patients in the German speaking part had sonography as opposed to 9.8% in the French speaking part. This inconsistency possibly results from a lack of consensus of international guidelines as outlined by a recently published systemic review [8] and from a lack of clear national guidelines. Both sonography and CT scan are considered accurate modalities for the diagnosis of diverticulitis [8]. The differences in Switzerland possibly represent a regional difference of diagnostic habits or availability of CT scan but should not be considered a difference in quality of diagnostic work-up.

Hospitals in the Italian speaking part of Switzerland had a significantly higher rate of parenteral nutrition in patients with uncomplicated as well as complicated diverticulitis. These hospitals seem not to follow current international recommendations to avoid parenteral nutrition and strive for an early normal oral caloric intake [8]. National guidelines concerning nutrition seem necessary.

There is a high consensus in Switzerland concerning conservative treatment of uncomplicated and complicated diverticulitis with high percentages of antibiotic use. The possible omittance of antibiotics in the treatment of diverticulitis seems not yet established in Switzerland.

Quality of in-hospital management of uncomplicated diverticulitis does not seem to vary among different language regions. Conservative management of uncomplicated diverticulitis has a high success rate in all parts of Switzerland with failure rates between 0% and 2.2%. Complication rates are low and do not differ among language regions. Given this high success and low complication rates, out-patient treatment approached might be reinforced in all parts of Switzerland.

Follow-up of uncomplicated diverticulitis on the other hand is significantly different between language regions. Whilst a planned colectomy is aspired in 17.1% of patients in German speaking areas, this is only the case in 4.8% of the patients in the Italian speaking part of Switzerland. Given the low international consensus on the recommendation of planned colectomy for patients with recurrent uncomplicated diverticulitis, hospitals seem to have highly unequal follow-up habits for these patients. Consensual guidelines in Switzerland would be beneficial.

An important difference among language areas is observed concerning the operative management of complicated diverticulitis. Patients in the French speaking part of Switzerland more frequently underwent Hartmann's procedure, resulting in a lower primary anastomosis and higher stoma formation rate. One might suspect a less guideline conform management in the French part of Switzerland. However, this impression is possibly deceiving. Patients in the French region had significantly higher Hinchey scores which explains a more restrictive attitude towards primary anastomosis. Hence one should argue for a higher rate of conservative treatment of Hinchey I and II complicated diverticulitis or higher Ambrosetti scores at CT scan in the French part of Switzerland, but neither of the two was the case. The inhomogeneity of Hinchey scores and hence operative procedure among Swiss language areas is not easily explained, but underlines the importance of clear guidelines on the operative management of complicated diverticulitis.

We note a higher percentage of teaching operation and surgeons with later graduation years in the French part of Switzerland. This does not involve higher complication scores for French speaking patients. Senior surgeons in hospitals of German and Italian speaking catchment areas might follow the attitude of their French speaking colleagues with the aim to uniform formation of young surgeons in Switzerland.

Out-patient follow-up and plan at discharge of diverticulitis patients is significantly different between language areas. Follow-up at out-patient clinic is performed in a high percentage of patients with complicated diverticulitis, ranging from 72.8% to 93.5%. Yet, the need for out-patient follow-up of uncomplicated diverticulitis is less clear. Whilst over 50% of patients in German areas receive follow-up appointments, this is the case in less than 40% of patients in Italian speaking regions. A planned colectomy after uncomplicated diverticulitis is aspired in 17.1% of patients in German speaking areas but only 4.8% of patients in the Italian speaking part of Switzerland. For complicated diverticulitis, these percentages amount to 42.9% and 22.2. This inconsistency clearly reflects the low international consensus on the recommendation of planned colectomy for patients with recurrent uncomplicated diverticulitis or previous episodes of complicated diverticulitis. Consensual guidelines on the follow-up and management post diverticulitis episodes would be beneficial in Switzerland.

A review of the current literature confirms a non-consensual health care system in the different Swiss language areas. The French speaking part of Switzerland has established a systematic mammography screening programs whilst other parts of Switzerland rely on an opportunistic screening of breast cancer [4]. We note a highly disparate and decentralized health care system in Switzerland. The French speaking part of Switzerland has a higher number of specialists per inhabitants, and patients directly consult specialists rather than general practitioners in these regions [5]. Furthermore, the French speaking region displays the highest health expenses pro capite [7]. These articles, although not studying diverticulitis patients, clearly underline the disparities in the Swiss health care system, which possibly aggravates the non-consensual treatment of diverticulitis patients in Switzerland due to the lack of clear national guidelines.





## **Conclusion**

In summary, use of diagnostic modalities, in-hospital management and out-patient follow-up of patients with colonic diverticulitis in Switzerland significantly varies with respect to the Swiss language area. A low consensus of international guidelines, lack of national recommendations and decentralized health care system are the possible causes of this inconsistencies. A nationwide guidelines is warranted in order to uniform our diverticulitis treatment approaches.

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