

# Monitoring of perioperative factor VIII treatment in a remote hospital by electronic diary smart medication™

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## Objective:

Specialized surgical procedures for patients with haemophilia may be required in hospitals far from the haemophilia centre. Close surveillance of postoperative bleeding and control of adherence to recommended factor VIII dosing is often difficult to achieve. Also, German law requires documentation of quantity and batch numbers of in hospital administered concentrates.

## Methods:

A 50-year old patient with severe haemophilia A presented with severe haemarthrosis in his right ankle joint. Arthrodesis or joint replacement were the treatments of choice, the latter in a remote hospital with excellent expertise concerning joint replacement but minor experience in haemophilia care. Interdisciplinary discussion including the patient's opinion led to joint replacement. The hospital was provided with a detailed treatment protocol. The patient himself was trained in electronic documentation system smart medication™ to keep record of treatment and clinical course.

## Results:

Operation and the following clinical course were successful leading to discharge after 13 days. Online surveillance by smart medication™ showed excellent adherence to our treatment protocol (Fig. 1). No significant bleeding occurred. Daily documentation of treatment (quantity and time of injection) and clinical course supported by photo documentation through the patient himself improved safety and efficacy of the procedure in spite of remote setup (Fig. 2). Documentation after discharge was according to regular prophylactic schedule and showed an excellent result 6 weeks after discharge (Fig. 3) Factor VIII of three different batches was used and could be summarized already at the day of discharge. The total amount of factor VIII used for operative and postoperative treatment was 68.000 Units. Factor VIII activity was 150% immediately before cut. Factor VIII activity were measured every morning (separate puncture before factor infusion) and showed levels between 77% and 205% according to discharge paper.

**FIG. 2**  
ONLINE TREATMENT PROTOCOL AND PHOTO DOCUMENTATION ON DAY BEFORE DISCHARGE.

Day	Date	Time	Institution	Batch No.	dose	units
Di	20.09.2016	09:15	In Hospital	C	2.000	IE
Mo	19.09.2016	19:00	In Hospital	B	2.000	IE
Mo	19.09.2016	10:45	In Hospital	B	2.000	IE
So	18.09.2016	19:45	In Hospital	B	2.000	IE
So	18.09.2016	08:30	In Hospital	B	2.000	IE
Sa	17.09.2016	18:45	In Hospital	B	2.000	IE
Sa	17.09.2016	08:30	In Hospital	B	2.000	IE
Fr	16.09.2016	18:30	In Hospital	B	2.000	IE
Fr	16.09.2016	09:00	In Hospital	B	2.000	IE
Do	15.09.2016	19:00	In Hospital	B	2.000	IE
Do	15.09.2016	09:15	In Hospital	B	2.000	IE
Mi	14.09.2016	20:00	In Hospital	B	2.000	IE
Mi	14.09.2016	08:15	In Hospital	B	2.000	IE
Di	13.09.2016	19:55	In Hospital	B	2.000	IE
Di	13.09.2016	19:55	In Hospital	C	1.000	IE
Di	13.09.2016	07:47	In Hospital	B	2.000	IE
Di	13.09.2016	07:46	In Hospital	C	1.000	IE
Mo	12.09.2016	18:45	In Hospital	C	1.000	IE
Mo	12.09.2016	18:45	In Hospital	B	2.000	IE
Mo	12.09.2016	10:22	In Hospital	B	2.000	IE
Mo	12.09.2016	10:21	In Hospital	C	1.000	IE
So	11.09.2016	18:36	In Hospital	C	1.000	IE
Sa	11.09.2016	18:30	In Hospital	B	2.000	IE
So	11.09.2016	07:39	In Hospital	B	2.000	IE
So	11.09.2016	07:35	In Hospital	C	1.000	IE
Sa	10.09.2016	19:15	In Hospital	A	3.000	IE
Sa	10.09.2016	08:00	In Hospital	A	3.000	IE
Fr	09.09.2016	21:00	In Hospital	B	4.000	IE
Fr	09.09.2016	09:30	In Hospital	B	2.000	IE
Fr	09.09.2016	01:00	In Hospital	B	2.000	IE
Do	08.09.2016	17:00	In Hospital	B	2.000	IE
Do	08.09.2016	07:35	Before Operation	A	6.000	IE
			Before Operation		68.000	IE



**FIG. 1**  
TREATMENT SCHEDULE

Patient: Schäfer, Michael  
Geburtsdatum: 23.03.1965  
Körpergewicht: 74 kg  
Diagnose: Hereditärer Faktor-VIII-Mangel, G. (D66G);  
Gerinnungskonzentrat: Advate (Fa. Baxter)  
Therapie: Sprunggelenkersatz

## Substitutionsplan mit Bolusinjektionen

### Am Op Tag:

- Unmittelbar vor Op **6000** IE i.v.
  - 8 Stunden nach der prä-Op Gabe **2000** IE i.v.
  - 16 Stunden nach der prä-Op Gabe **2000** IE i.v.
- (Falls intraoperativ Blutungen auftreten bei Bedarf zusätzlich **2000** IE i.v.)

### Ab dem 1. Post Op Tag:

	Morgens	Abends (12 Stunden nach morgendl. Gabe)
1. Post-Op Tag	4000	4000
2. Post-Op Tag	3000	3000
3. Post-Op Tag	Weiter nach Rückspr.	

## Bitte beachten:

**Kein Heparin**, Acetylsalicylsäure oder andere die Gerinnung oder Thrombozytenfunktion hemmende Substanzen verabreichen.  
Keine i.a. oder i.m. Injektionen  
Tägliche Kontrolle von Blutbild, PTT und Faktor VIII (Vor morgendlicher Substitution und nicht aus der liegenden Kanüle)

## Bei Rückfragen:

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19.08.2016

Dr. med. Wolfgang Mondorf

Datum

**FIG. 3**  
ONLINE TREATMENT PROTOCOL FOLLOWING DISCHARGE. PHOTO DOCUMENTATION 6 WEEKS AFTER DISCHARGE.

Day	Date	Time	Institution	Batch No.	dose	units
Mo	23.01.2017	20:15	Home treatment	E	1.000	IE
Do	19.01.2017	17:15	Home treatment	E	1.000	IE
Mo	16.01.2017	17:30	Home treatment	E	1.000	IE
Do	12.01.2017	06:00	Home treatment	E	1.000	IE
Mo	09.01.2017	09:15	Home treatment	E	1.000	IE
Fr	06.01.2017	11:15	Home treatment	E	1.000	IE
Di	03.01.2017	11:15	Home treatment	E	1.000	IE
Sa	31.12.2016	11:30	Home treatment	E	1.000	IE
Di	27.12.2016	15:00	Home treatment	F	1.000	IE
Sa	24.12.2016	11:30	Home treatment	F	1.000	IE
Mi	21.12.2016	09:00	Home treatment	F	1.000	IE
So	18.12.2016	09:15	Home treatment	F	1.000	IE
Mi	14.12.2016	07:30	Home treatment	F	1.000	IE
Mo	12.12.2016	07:30	Home treatment	F	1.000	IE
Fr	09.12.2016	10:00	Home treatment	F	1.000	IE
Mi	07.12.2016	07:30	Home treatment	F	1.000	IE
So	04.12.2016	09:50	Home treatment	F	1.000	IE
Do	01.12.2016	10:00	Home treatment	E	1.000	IE
Mo	28.11.2016	10:30	Home treatment	E	1.000	IE
Fr	25.11.2016	12:25	Expense	G	30.000	IE
Do	24.11.2016	10:45	Home treatment	D	1.000	IE
Mo	21.11.2016	11:15	Home treatment	D	1.000	IE
Do	17.11.2016	10:15	Home treatment	D	1.000	IE
So	13.11.2016	11:30	Home treatment	D	1.000	IE
Do	10.11.2016	16:00	Home treatment	D	1.000	IE
Sa	06.11.2016	11:30	Home treatment	D	1.000	IE
Do	03.11.2016	08:30	Home treatment	D	1.000	IE
Mo	31.10.2016	10:45	Home treatment	D	1.000	IE
Do	27.10.2016	08:30	Home treatment	D	1.000	IE
Mo	24.10.2016	11:00	Home treatment	D	1.000	IE
Do	20.10.2016	08:15	Home treatment	D	1.000	IE
Mi	18.10.2016	15:53	Expense	F	28.000	IE
Mi	18.10.2016	15:52	Expense	E	2.000	IE
Mo	17.10.2016	11:45	Home treatment	D	1.000	IE
Fr	14.10.2016	11:30	Home treatment	D	1.000	IE
Di	11.10.2016	09:15	Home treatment	D	1.000	IE
Sa	08.10.2016	11:45	Home treatment	D	1.000	IE
Mi	05.10.2016	09:15	Home treatment	D	1.000	IE
So	02.10.2016	11:15	Home treatment	D	1.000	IE
Do	29.09.2016	10:15	Home treatment	D	1.000	IE
Mo	26.09.2016	12:30	Home treatment	D	2.000	IE
So	25.09.2016	11:00	Home treatment	D	2.000	IE
Sa	24.09.2016	13:30	Home treatment	D	2.000	IE
Fr	23.09.2016	11:15	Home treatment	D	2.000	IE
Do	22.09.2016	11:45	Home treatment	D	2.000	IE
Mi	21.09.2016	10:00	Home treatment	D	2.000	IE



## Conclusion:

- Electronic diary smart medication™ improves and facilitates surveillance and documentation in remote perioperative haemophilia care.
- According to literature (Orthopädische Hämophiliebehandlung. I. Scharer, L. Hovy 1997) the calculated factor VIII requirement was 108.000 Units. Thorough electronic surveillance by smart medication™ enabled a significant saving of resources by a reduction of 40.000 units factor VIII especially during the postoperative period.
- Including factor VIII measurements into smart medication™ may further improve safety in the postoperative phase.