MEASURING PATIENT COMPLIANCE
IN INHALATION STUDIES BY SMART CARD TECHNOLOGY

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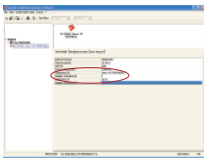
BACKGROUND

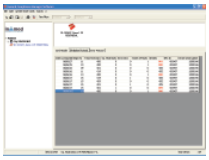
Patient compliance during a study is an important factor in view of assessing the clinical effect of a treatment. This is especially true when patients administer the drug at home. Usually, patient records, counting of returned doses or mechanical counters are used to track compliance, which may be biased by the study subjects. This report is about an aerosol study in CF which used a device for controlled breathing (AKITA® inhalation system, Activaero, Germany). The device works with a patient-individual smart card that records every single breath during a treatment including a date/time stamp in an encrypted manner. Each patient's inhalation protocol can be displayed by loading the smart card into the proprietary "Compliance Manager" software.

The AKITA Smart Card contains the patient-individual breathing pattern. During treatment, each single breath is recorded onto the Smart Card.

After a treatment period, the Smart Card can be collected and data can be...



...loaded into a proprietary software to display the inhalation record of a patient.



The protocol of a patient shows no. of breaths, deviations from instruction, date and time, any errors occured and for tracking purposes the ID of the used Smart Card and device.

MEASURE 1: TOTAL DOSE COMPLIANCE

$$TDC = \frac{\text{Total no. of breaths taken during the treatment period}}{\text{Total no. of breaths per protocol}} * 100$$

MEASURE 2: DAILY SCHEDULE COMPLIANCE

$$DSC = \frac{\text{No. of days with a predefined number of breaths}}{\text{No. of therapy days per protocol}} * 100$$

MATERIALS AND METHODS

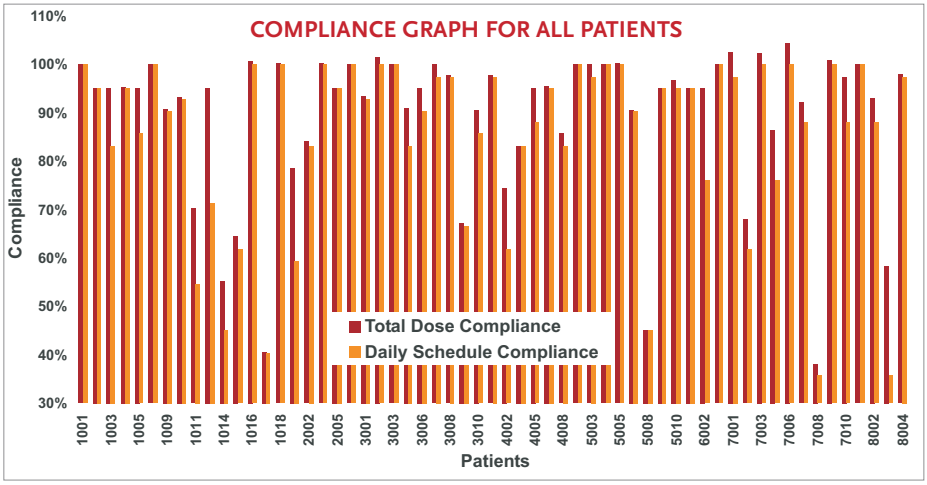
For this report, the data set of a recent controlled study (Griese et al., 2007) was analyzed. 72 CF-Patients were instructed to inhale with the AKITA inhalation system at home for 42 days. After the study, the smart cards were returned to Activaero, and the inhalation records on the chip were analysed. We analysed the compliance of patients who participated at least 21 days (59 out of 72 patients, others deemed to be drop-outs).

RESULTS

Average TDC was 89.54% ± 15.82% (median 95.31%), while average DSC was at 85.47% ± 18.13% (median 92.86%). The analyzed patients performed treatments at a mean of 36.53 ± 6.76 days (median 39). Most of the patients showed a DSC which is lower than the TDC, indicating that they had missing treatment days, which were compensated by additional inhalations on other days. We found 9 patients with a DSC more than 10% lower than their TDC (max difference: 23.81%).

DISCUSSION, CONCLUSION

This aerosol study with home treatment demonstrated a high compliance rate for TDC and DSC. This information is more reliable for compliance than study participation in days alone. For future studies it is recommended to define in the protocol not only a minimum of study participation in days but also a minimum in TDC and DSC. In addition the compliance thresholds may be defined with regard to the drug's pharmacokinetic profile. In general, the inhalation record of the AKITA smart card provides an unbiased view of the inhalations treatments during a study especially when the subjects perform the inhalations at home. Compliance calculations as shown above may be performed and linked to other outcomes of a study for validation. Compliance data like these may also be used routinely by the treating physician in order to guide and supervise his patients.



Graph 1: TDC and DSC for the patients within the study. In most cases, Total Dose Compliance is higher than Daily Schedule Compliance, indicating that patients caught up missing inhalations of one day on a following day.

SAMPLE PATIENT RECORDS

Date	Breaths per Instruction	Time	Abort	Actual Breaths
3. Feb.	73	12	1	0
3. Feb.	73	18	0	73
4. Feb.	73	18	0	73
5. Feb.	73	18	0	73
6. Feb.	73	18	0	73
7. Feb.	73	18	0	73
8. Feb.	73	18	0	73
9. Feb.	73	18	0	73
10. Feb.	73	18	0	73
11. Feb.	73	18	0	73
12. Feb.	73	18	0	73
13. Feb.	73	18	0	73
14. Feb.	73	18	0	73
15. Feb.	73	18	0	73
16. Feb.	73	18	0	73
17. Feb.	73	18	0	73
18. Feb.	73	18	0	73
19. Feb.	73	18	0	73
20. Feb.	73	18	0	73
21. Feb.	73	20	0	73
22. Feb.	73	18	0	73
23. Feb.	73	18	0	73
24. Feb.	73	18	0	73
25. Feb.	73	18	0	73
26. Feb.	73	19	0	73
27. Feb.	73	18	0	73
28. Feb.	73	19	0	73
29. Feb.	73	18	0	73
1. Mrz.	73	18	0	73
2. Mrz.	73	18	0	73
3. Mrz.	73	18	0	73
4. Mrz.	73	18	0	73
5. Mrz.	73	18	0	73
6. Mrz.	73	18	0	73
7. Mrz.	73	18	0	73
8. Mrz.	73	18	0	73
9. Mrz.	73	18	0	73
10. Mrz.	73	18	0	73
11. Mrz.	73	18	0	73
12. Mrz.	73	18	0	73
13. Mrz.	73	18	0	73
14. Mrz.	73	18	0	73
15. Mrz.	73	18	0	73

Table 1: This table shows a sample patient (random no. 1008) with a perfect compliance over the total duration of the study.

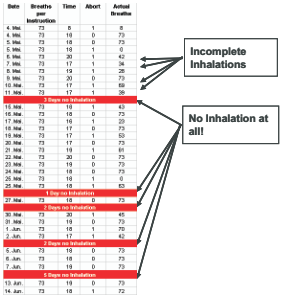


Table 2: This table shows a sample patient (random no. 8003) with a very poor compliance. Some days (marked in red) are missing totally, on other days, the inhalation treatment has not been completed.

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