

# Emerging Patterns of Communication in a Pharmacist-Patient Health Information System

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## 1 Introduction

Communication between healthcare professionals and patients is a major determinant of patients' satisfaction, patients' adherence, health outcomes, and ultimately of healthcare costs [1]. In most cases, however, personal communication between a healthcare professional and a patient is restricted to episodic face-to-face encounters. Once the face-to-face encounter comes to an end, structured communication ends. The absence of structured communication in time intervals between face-to-face encounters is a defining characteristic of current healthcare professional-patient interaction [2,3]. As a consequence, healthcare professionals lack the ability to guide patients outside the institutional space and to adjust supportive measures depending on particular situations and needs that arise during the therapeutic process.

Pharmacist-Patient Health Information Systems (PPHIS) aim to address this limitation by enabling structured communication between a pharmacist and a patient subsequent to their episodic face-to-face encounter [2,3]. In multiple build and evaluation cycles and in close collaboration with 21 Swiss pharmacies over the duration of three years, a PPHIS prototype has been developed and continuously improved, following the design science research paradigm [4,5]. Research in this field has resulted in design principles for PPHIS [2], in the development of several PPHIS prototypes, and suggested a methodology for evaluating emerging patterns of communication between pharmacists and patients [3].

The current work builds upon this research and asks the following research question: What patterns of communication emerge in a PPHIS? This work specifically focuses on nutrition counseling in the context of diabetes mellitus and obesity. Nutrition counseling was so far limited to the face-to-face encounter in the pharmacy. Guidance of the patient and support of behavioral changes outside the pharmacy was not available in traditional counseling regimens although its effectiveness has been shown [6]. Nutritional counseling employing the PPHIS allows for structured communication subsequently to the face-to-face encounter, thus fundamentally expanding and augmenting healthcare professional-patient communication. In the following, the PPHIS and first results are described.

## 2 Design of the Artifact

The design of the artifact is based on the design principles and instantiation of genres for PPHIS as described in [2,3]. The developed PPHIS prototype consists of (1) a tablet-PC application that enables communication and monitoring of patients by pharmacists, (2) a smartphone application<sup>1</sup> used by patients that guides them along the defined interaction-template as configured by the pharmacist and allows for communication with the guiding pharmacists<sup>2</sup>, and (3) a mobile backend service to synchronize the usage data of the different clients.

During the face-to-face encounter with the patient, the pharmacist uses the tablet-PC to choose among a variety of interaction-templates based on indication or drug. These templates define at which time-points specific forms of communication become available for the patient and therefore enable pre-defined and structured communication after the patient's pharmacy-visit. As an example, a template may be configured so that the patient receives a defined information element on the second day following a pharmacy visit or is asked for a photo documenting therapeutic progress on day four. Currently templates for antimicrobial therapy, skin diseases, pain management, and nutrition counseling for obesity and type 2 diabetes are implemented.

Fig. 2 shows an annotated screenshot of the tablet-PC application. After adding a patient to the system, a personal code is generated that is sent to the patient via SMS including a link to the app. The patient is then asked for this code as shown in Fig. 1 (Screen 1). Screen 2 shows the main screen visualizing the interaction-template over the specified duration. Screen 3 is specific to the type of communication item and may include e.g. a photo function or a status update. Screen 4 shows the dialog function with the possibility for spontaneous communication. This dialog is also available to the pharmacist on the tablet-PC whenever situation-dependent communication or feedback is needed, complementing the pre-defined communication process.

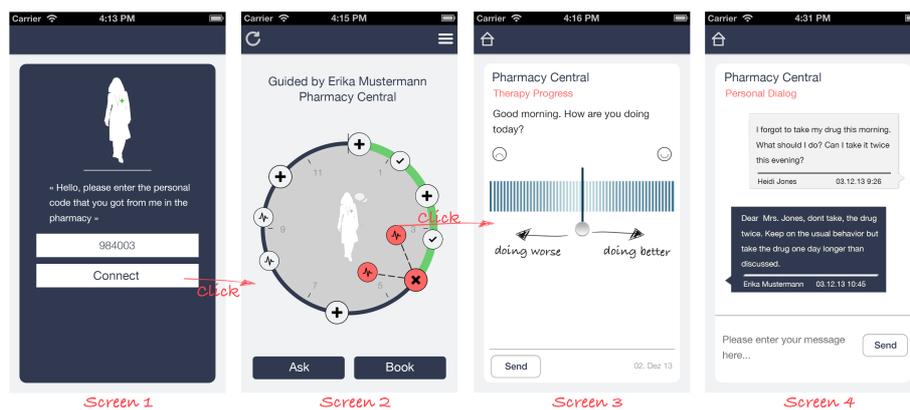


Fig. 1. Patient's user interface screens on a smartphone

<sup>1</sup> <https://itunes.apple.com/ch/app/alphastreams/id579920749?mt=8>

<sup>2</sup> <https://itunes.apple.com/ch/app/as-cockpit/id687267702?mt=8>

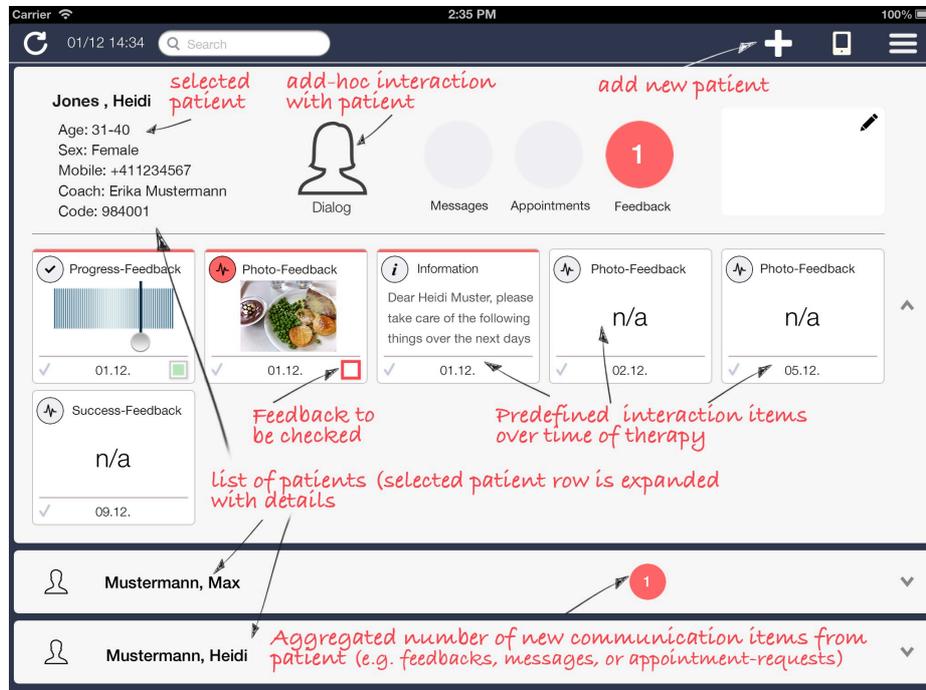


Fig. 2. Pharmacist's user interface main screen on a tablet-PC

### 3 Significance to Research and Practice

The PPHIS enables structured communication in situations where there was none, impacting both practice and research. From a practical perspective, structured communication beyond the face-to-face encounter enhances and augments healthcare professional-patient interaction. The spatial and temporal limitations of the face-to-face encounter are overcome, enabling patient support and guidance outside the institutional spaces, at best improving treatment outcomes while leveraging existing resources. The consequences for research range from questions of HIS design to more clinically oriented questions such as patient adherence and health outcome, all of which can be addressed with the PPHIS.

### 4 Evaluation of the Artifact

Rollout of the PPHIS to 21 participating pharmacies is underway. Pharmacists in three pharmacies are already using the system for patient support following the pharmacy visit. The current evaluation focuses on three customers in a Swiss pharmacy that have participated in the nutrition counseling. Patients were guided by a pharmacist with an educational background in nutrition counseling for one week subsequent to the pharmacy visit. Previously, nutrition counseling consisted of an initial 45-

minute session in the pharmacy where the specific situation was discussed and several recommendations for nutrition intake were derived that the patient should follow. In a subsequent second meeting, after one or two weeks, it was discussed how the patient was able to follow the recommendations.

With the introduction of the PPHIS, the pharmacist also provided guidance and support once the patient had left the pharmacy. The nutrition-counseling interaction-template is specified for seven days and includes four information-elements that are generated by the system and customized by the pharmacists (e.g. the recommendations agreed upon). In addition, patients are reminded every morning to document food intake throughout the day. Patients were also able to ask questions and to make additional comments with regard to their food intake. The pharmacist was informed when a new photo of a meal or message was available and could advise accordingly.

On the last day of the follow-up, the patients received a survey within the app. Table 1 shows the items of the survey that are based on “relative advantage” [7], the “information-, motivation-, and strategy model” [1], and the net promoter score (NPS) [8].<sup>3</sup> All items except the NPS were rated on a 7-item Likert scale from “strongly disagree” to “strongly agree”. Results demonstrate that patients perceived the PPHIS as very useful, felt better supported, and would recommend it to their friends (NPS). Table 1 also shows the communication frequency between pharmacist and patient. Patients documented between 7 and 33 photos of food intake and wrote between 10 and 44 messages to the pharmacist. The pharmacist communicated between 9 and 29 times to the patient and checked all the photos.

**Table 1.** Frequencies & Survey Results

Patient	Sex	Age	# Photos	# Messages from Patient	# Messages from Pharmacist	Follow-up useful	Information helpful	More motivated	Better supported	Net Promoter Score	Why would you recommend or not recommend it?
1	F	41-50	7	10	9	6	3	6	6	6	Easy to use. Don't like taking photos, but the tips from the pharmacist are really helpful.
2	M	19-30	32	23	29	7	6	7	7	9	It is very personal and innovative.
3	F	19-30	33	44	27	7	7	7	7	10	I would recommend it, because it is fun and the tips can be directly applied. I was much more aware of food selection.

Analyzing communication, the patterns described in Table 2 emerged between pharmacist and patient. Table 3 shows the emerging communication patterns from patient to pharmacist (single messages may relate to multiple patterns, but also to no pattern).

<sup>3</sup> The complete survey with full-length questions can be requested from the first author.

**Table 2.** Communication patterns of pharmacist

Pattern	Examples	#
Informational messages	“This meal has too much fat in it. Try to avoid the sauce.”	18
Strategic messages	“Vegetables or fruit should be eaten 5 times a day.” “Use the sauce only for the meat not the vegetables.”	12
Motivational messages	“Very good meal.” “You are getting much better.”	11
Requesting information	“Send me a photo of the ingredients label”	10
Providing tips/alternatives	“The pasta sauce should include more tomatoes.” “Eat more of the bread that helps against the hunger.”	9
Answering questions	“Dark bread is usually better than French bread, because it has less sugar.”	6

**Table 3.** Communication patterns of patients

Pattern	Examples	#
Commenting on photos/meals	“I ate only half of the meal ;-)” “I drank two liters today.”	45
Commenting on behavior or progress	“Could not eat something else because I was in meeting all day.” “Headache is getting better”.	25
Asking for information or advice	“Which cereal is better: With chocolate or honey?” “What are the properties of pumpkin oil?”	7

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