

**On-call duties in hospital pharmacies: national survey and elaboration of  
a training program for pharmacy residents**

**Gardes en pharmacie hospitalière: enquête nationale et élaboration d'un  
programme de formation pour les internes**

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**Key words:** residents training; in-house on-call duties in hospital pharmacies; harmonization of practices; quality improvement, risk management

**Mots clés:** formation des internes ; gardes en pharmacie hospitalière, harmonisation des pratiques ; amélioration de la qualité ; gestion des risques

## ABSTRACT

### Objectives:

During their residency, pharmacy residents are required to attend a hospital on-call program in order to insure the continuum of care for inpatients. This activity is subject to risks, and requires a prior training. Our aim was to develop and to optimize such a training program.

### Methods:

To this end, we first established a baseline study of the existing training methods in our hospital and those in the different hospitals of France in which pharmacy residents realize in-house on-call duties, associated with an identification of both pharmacists and students' needs in our institution. These preliminary studies were used to create a transversal, structured and harmonized training program.

### Results:

The results of our national survey highlighted great disparities of training between the establishments and point out the lack of structure, organization and harmonization of the training, which residents expected to be improved. Our training program contains 3 parts: initial theoretical training, initial practical training and continuous training. Beyond the harmonization of the theoretical training's materials between the different sectors of the pharmacy, new tools were introduced like an in-house on-call duty notebook complementary to trainings adapted to note taking, simulation's workshops and interactive quizzes. The training was gradually implemented in our hospital pharmacy, in collaboration with the pharmacists of the different activity sectors

### Conclusions:

The next steps of our work will be to assess pharmacists and pharmacy residents' satisfaction about our program and its efficacy.

## **RESUME**

### **Objectifs:**

Au cours de leur internat, les internes en pharmacie sont appelés à réaliser des gardes pour assurer la continuité des soins des patients hospitalisés. Cette activité à risque nécessite une formation préalable. Notre objectif a été de développer et d'optimiser un programme de formation adapté à cette activité.

### **Méthodes:**

Un état des lieux initial des formations existantes a été réalisé au sein de notre hôpital et dans les différents établissements hospitaliers français dans lesquels les internes en pharmacie effectuent des gardes. Un programme de formation transversale, structuré et harmonisé a été créé.

### **Résultats:**

Les résultats de l'enquête nationale soulignent d'importantes disparités entre les établissements concernant la formation. Ils mettent aussi en exergue le manque de structuration, d'organisation et d'harmonisation de cette formation et les souhaits d'amélioration des internes. Le programme de formation développé est constitué de 3 parties : formation théorique, pratique et continue. Outre l'harmonisation des supports de formation utilisés, de nouveaux outils ont été introduits tel qu'un guide pratique de garde, des sessions de simulations sur des cas réels et des questionnaires interactifs. Le programme a été implémenté de façon graduelle en collaboration avec les pharmaciens de chaque domaine d'activité.

### **Conclusions:**

La prochaine étape de ce travail sera d'évaluer son impact sur la satisfaction des internes et des formateurs ainsi que sur l'efficacité des formations.

## **I. INTRODUCTION**

In several countries in the world (1,2) the training of future hospital pharmacists includes several years working under supervision in hospitals. Often called pharmacy residency, it allows pharmacy residents to put their theoretical knowledge into practice with training courses in different pharmacy activity sectors (3). In France it lasts 4 years and is composed of eight 6-month training courses. Like in other countries, it also includes the obligation to attend a hospital on-call program (4), to maintain a continuum of care for inpatients outside daily working hours. In the main French regional establishments, it consists in in-house on-call duties. On-call activities are varied and may be different from one hospital to another. The core activity is drug and medical devices dispensing but pharmacy residents may also be involved in the manufacture of medicines, assist the on-call pharmacist who realizes chemotherapy preparations or solve a sterilization problem.

This on-call work is subject to risks especially due to emergencies: pharmacy residents have to be able to carry out each of them and to prioritize some requests. Some situations may lead to stress and cause them to make wrong choices. In addition, residents are often alone to face the requests coming from all the hospital's clinical units, and can rapidly be submerged. On-call activities can furthermore be very different from the residents' daily routine making it difficult to perform adequately these activities. To sum up we can distinguish contributing factors for medications errors in all these elements (5–8): lack of experience, small staff, context of emergency, accumulation and interruption of tasks, stress and tiredness. Over the past few years the importance of training for healthcare providing was pointed out to reduce medication errors and secure medical and pharmaceutical practices (6–8). Developing the residents' training could represent one of the means to prevent medication errors and improve practices.

There is currently no standardized on-call program in France: each establishment sets up its own organization rules. The training must be fast and efficient, as they have also to train for their daily activities. With a goal based on securing the medication process and improving quality in our hospital, our project was to optimize pharmacy residents' training for in-house on-call duties and thus to develop a structured training program, including theoretical and practical courses, which could be implementable in any hospital.

## **II. MATERIEL AND METHODS**

A working group was established constituted of the residents' coordinator, the training

referent at the pharmacy department and the pharmacy residents' representative.

First a baseline study of the existing training methods in our hospital and those in the different hospitals of France associated with an identification of both pharmacists and students' needs in our hospital was conducted. Figure 1 presents the flowchart of the methodology that was used.

Secondly, we used the results of the different surveys to optimize the existing training program based on 3 steps: initial theoretical training, initial practical training and knowledge assessment/continuous training. We tried to develop and improve it by introducing new training methods such as e-learning and simulation.

#### **A. Baseline study of the training methods and identification of needs**

The working group met regularly to create the different surveys intended to characterize in-house on-call duties and the related training provided to residents in France, and to identify pharmacists and residents' needs about the current training to on-call activities in our hospital.

##### **1. In our hospital**

We created a 23 questions survey using RedCap<sup>®</sup> software intended to the 10 senior pharmacists in charge of the different activity sectors about their training's characteristics and their opinion. Some questions focused on their satisfaction about the training they give and their possible needs for more time or means.

Pharmacy residents' opinions and needs were collected using 12 surveys created with Google form<sup>®</sup> about the training's modalities, strengths and suggestions for improvement.

##### **2. In the other hospitals in France**

A 28 questions survey was created with Google form<sup>®</sup> to characterize the training conditions. The last question called "Comment" enabled the residents to express themselves freely. It was sent by email to the 25 French pharmacy residents' associations. The translated version of the survey is presented in Supplementary Data.

#### **B. Elaboration of our training program**

The group met regularly to think about a training program matching the expectations of both pharmacists and pharmacy residents. Its requirements were the following:

- To ensure all residents get adequate training

- 165 - To standardize the training between all the sectors
- 166 - To be repeatable
- 167 - To be inexpensive
- 168 - To develop practical training
- 169 - To be time efficient i.e. with a suitable format and arranged to facilitate fast learning
- 170 - To introduce innovative tools

171 It was presented to all senior pharmacists of our hospital for validation and then developed  
172 gradually by a step-by-step approach, starting with the more critical pharmacy activity sectors  
173 (activities occasionally done during on-call shifts, technicity and/or complexity of these  
174 activities).

### 175 **III. RESULTS**

#### 176 **A. Baseline study of the training methods and identification of needs**

##### 177 **1. In our hospital**

178 The training currently takes place at the beginning of each 6-month period. It is provided by  
179 the 10 senior pharmacists and includes a theoretical training, often completed with a practical  
180 training. Each training session lasts between 30 minutes up to 2 hours.

181 Except for one sector, each theoretical training course is given to the entire group of all the  
182 residents, which suits all of senior pharmacists. The most widely used training tool is oral  
183 explanations (55%) often completed with paper documents (45%) and/or slideshows (45%).  
184 The content often includes a presentation of the service with its general (64%) and specific  
185 (55%) operational modalities. Internal procedures are sometimes presented (55%). Some  
186 practical issues are explained such as concrete cases (55%) or older residents' experiences  
187 (55%). The majority of senior pharmacists considered they have enough time to realize it  
188 (91%). They are all in favor of the current organization of theoretical teachings during the  
189 first two weeks of each semester.

190 Practical training is generally dispensed to all residents (56% of trainings) and consists mainly  
191 of oral explanations (67%) through complementary training with pharmaceutical assistants  
192 and technicians (78%), practical exercises/performances (56%) and detailed visit of the  
193 facilities (56%). It is completed by a part of companionship between experienced and novice  
194 residents. Senior pharmacists don't need additional time for their practical training (78%) and  
195 the current organization suits all of them.

Once trainings are completed, pharmacy residents have to take a 2-hours written knowledge assessment; its modalities satisfy 90% of senior pharmacists who think it enables them to correctly assess residents' knowledge.

To conclude 55% of them are satisfied with their current training, but some think it could be improved if they had additional time (27%) and/or means (9%).

Residents returned 133 surveys (85%) which represents on average 10 surveys per resident. The participation rate of each survey was between 69% and 92%. The training was globally well appreciated by the residents but its organization and modalities could be improved (Figure 2).

## 2. In the other hospitals in France

34 hospitals returned 108 completed surveys (Figure 3) but 2 hospitals were excluded (activities described were not within the scope of this work).

Between 7 and 26 residents are involved in the on-call program in each establishment. In 44% of hospitals, they realize the on-call component in a different site from the one they work in during the day. Residents are often alone (84%) to realize on-call activities. The different on-call activities distribution is presented Figure 4A.

All trainings at the beginning of each 6-month period was provided by pharmacists. It is mainly composed of both theoretical and practical parts (81%) but sometimes only of a theoretical (13%) or a practical part (6%) (Figure 4B).

Theoretical training is often given to the entire group of all the residents (87%) and mainly lasts between 5 to 10 hours (36%) or between 10 to 15 hours (27%) (Figure 4C). The support used is oral explanations (93%) and/or slideshows (67%). It often includes a presentation of the activity sector with its general (93%) and specific (97%) activities completed with a description of facilities (97%). Internal procedures can be presented (83%). The functionalities used in the pharmacy software are also explained (93%) (Figure 4E).

Practical training is generally given to small groups of residents (64%). It is shorter than theoretical training as it takes between 5 to 10 hours (46%) or less than 5 hours (43%) (Figure 4D) and the main support is oral explanations (100%). It contains principally practical

exercises/performances (71%), practical software or specific computer resources training (75%) and detailed visit of the facilities (75%) (Figure 4F).

An evaluation session has been set up in 47% of hospitals. It is mainly composed of practical sessions/performances (67%) and/or written evaluation (53%) and often lasts 1 hour (66%).

The evaluations were corrected by pharmacists in all cases.

This survey was well perceived by pharmacy residents. Some residents think the training they received is too light, too short and/or not practical enough. Some of them feel unsecure and considered in-house on-call duties as dangerous.

## **B. Elaboration of our training program**

The working group matched the results of the different surveys and the current training program with the objectives to create an efficient and complete training program (Figure 5).

The major decisions are presented hereafter:

- To maintain the current training organization (i.e. the consolidation of all theoretical trainings during the first two weeks of each 6-month period).
- Development of practical training sessions using simulation
- Implementation of e-learning modules and evaluations (using quizzes and e-learning) to be realized throughout the semester

Our training program presented in Figure 6 was validated by the senior pharmaceutical team in April 2017.

We began to set it up for outpatient dispensing practices, because of the higher risk of potential errors, the wide variety of situations and the stress of being in direct contact with the patients, and the following activities in which it was implemented were inpatient dispensing and temporary authorized drugs dispensing.

### ***a) Theoretical training (Task 2)***

We harmonized the training materials between the different pharmacy sectors by developing a common frame with the software Powerpoint® (Task 2.1).

We added a theoretical training about the declaration of adverse events (introduced in May 2017).



To help pharmacy residents to assimilate the trainings' explanations and take notes at the same time, an in-house on-call duty notebook was developed (Task 2.2). It contents:

- the training program's schedule
- a general introduction to in-house on-call duties
- a module for each pharmacy activity sector: the detailed plan of the theoretical training support with blank spaces for note taking, the plan of practical training and a check-list of skills to have gained at the end of the training.

We implemented a 1-hour training course about in-house on-call duties' generalities and its practical organization (Task 2.3) on the first day of each 6-month period. It combines a visit of the pharmacy and explanations about practical aspects of on-calls duties.

Pharmacy residents regularly meet with the residents' coordinator to talk about in-house on-call duties' conduct. We created in June 2017 a dedicated insert in each written sum up (Task 2.4) that will come back on a difficult situation lived by a resident and how to deal with it.

#### ***b) Practical training (Task 3)***

Role-play was chosen as the simulation model (Task 3.1).

The set up of simulation's workshops requires (Task 3.2):

- a test version of the pharmacy software program
- a room to realize the workshops; we opted for the pharmacy conference room that will be reconfigured to recreate as faithfully as possible the real conditions of on-calls' equipment and layout
- accurate scenari and corresponding debriefing sheets
- a satisfaction survey

To optimize the efficacy of the companionship between residents we set up in May 2016 a planning which limits the number of new residents taking part in old residents' on-call duties (Task 3.3).

#### ***c) Evaluation of knowledge/Continuous training (Task 4)***

The current written test was maintained and completed with other forms of evaluation:

- a continuous evaluation by using Quizz boxes® at the end of some monthly coordination meeting (a databasis of MCQ tests was created) (Task 4.2); the residents' coordinator will choose 4-5 questions to evaluate the residents.

- the implementation of e-learning sessions for the continuous training and the evaluation of knowledge will request more time depending of institutional choices and investments (Task 4.1).

#### IV. DISCUSSION

The results of our preliminary study about the on-call duty training conditions in French hospitals highlight the great disparities in training between the establishments and point out the lack of structure, organization and harmonization of the training. The main differences are the following:

- Some training programs are only composed of a theoretical or a practical part whereas these two parts are complementary. An evaluation of knowledge occurs in only 47% of hospitals, despite the fact that it is fundamental to evaluate the efficiency of training and what the participants understand and remember.

- All the trainings occur at the beginning of each 6-month period and only 6% of the hospitals set up a continuous training. It may be an issue because pharmacy residents receive a lot of information in a very short period and have no occasional reminders during the rest of the semester. The duration of the theoretical and practical training is of 5 and 10 hours respectively: this duration could seem insufficient in the light of the numerous activities residents have to master.

- Training supports exist in various forms, being mainly oral explanations: it means that residents have no written trace of trainings they received except of their inner notes.

This lack of harmonization between the institutions is inconsistent with the current trend in the health field to have harmonized practices, especially in the context of territorial hospital organizations required by the law of modernization of the French health system in 2016 (12). Our results show that residents do sometimes feel that their training is insufficient, which could be even truer for residents with daily activities that are not similar to the on-call duties they have to perform, or for residents coming from other surrounding hospitals. A formalized and harmonized on-call duty training program can help them to gain knowledge and skills that can be used everywhere. Our training program can represent a first modest step in the way of homogenization between health institutions. It could enable residents to take full advantage of on-call experience, which would provide benefits such as the opportunity to practice

autonomously, thinking critically, using their knowledge base and developing decision-making skills (13,14).

Very little data exist in the literature about on-call programs and training although pharmacists' on-call duties is a common practice all over the world (2,13–16); no homogenization approach is currently identified. Holder and al. realized a national survey in the United States to characterize on-call practices. It identifies variations in activities, location, hours and requirements in on-call programs (15). The most common or frequent activities are drug information consultations, therapeutic drug monitoring, and anticoagulation monitoring, which means that the American on-call activities get closer to clinical pharmacy.

Training is nowadays a key element in any new activity in healthcare: it is mandatory in France for the healthcare professionals since the 2009 HPST law (17) introduced the obligation of continuing professional development and was reinforced by the law of modernization of the French health system in 2016 (12). Moreover the 2009 HPST law obliged the French establishments to define and put into practice a continuous quality and safety of the care improvement policy and a risk management process in order to prevent and treat the adverse events bound to their activities. Training is a way to anticipate the risks of any new activity and belongs to the tools used for the *a priori* risks management as referred to in several French laws. Thus some studies tend to show that training helps to decrease medication errors but further observational studies will be necessary to precise and quantify this point (18,19). Instilling a culture of safety may have a greater impact on reducing medication errors (20). To facilitate the implementation of an adequate and complete training program, it could be worthwhile to introduce some key elements concerning on-duty activities in the initial theoretical cursus of the residents, using the current reform of their 3<sup>rd</sup> cycle studies (R3C) as a possibly simple way to fast-track these changes.

We developed a simple but optimized and standardized training program for pharmacy residents by referring to the model of the Deming wheel (Plan-Do-Check-Act). Our working group first structured it in simple and independent tasks, in order to be able to rapidly put it in place without additional resources. Changes in work habits are not easy to set up and it sometimes takes time for work teams to put personal preferences aside and change their behaviors (21,22). Some principles are known to improve adherence to protocols in care units (21–23): effective communication, interdisciplinary collaboration between physicians and nurses, leadership support, organizational aspects and protocol's simplicity. To enhance adherence, our training program was approved by all the pharmacists before implementation.

Moreover we will regularly evaluate the efficiency of our program and collect pharmacists and residents' opinion about it.

Indeed the current trends in term of education actively involve learners who become actors in the learning methodology (24). It goes even farther as we attend a “gamification” of training with the development of serious games (25,26).

The main advantages of these new training methods are (25–29): its flexibility, the increase of students' motivation, a significant freedom for learners, the promotion of communication, student-to-student interactions and peer-learning, the increase of self-confidence and reduction of anxiety, the development of some cognitive and emotional skills. Nevertheless game-based learning haven't really demonstrated their efficacy in term of learning alone or compared with other classical teaching modalities (25,28–30). Some studies suggest a good efficacy of the combination of various teaching techniques (26–29), indicating that one lone tool might not be sufficient to achieve maximum training efficacy. In our case, the impact of the training on the management of the continuum of care for inpatients could be measured by a review of adverse events declared by the clinical units (number of dispensing errors for example) and by an assessment of their satisfaction of this activity. The quality of the pharmacy - clinical units relationship could also be investigated.

## **V. CONCLUSION**

The next step of our work will be to assess our training program: we will conduct a study to measure its impact on errors occurring during on-call duties and to measure the pharmacists and pharmacy residents' satisfaction, and then implement any necessary changes.

## **VI. COMPETING INTERESTS AND FUNDING**

The authors declare no competing interests nor funding for this work.

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## VIII. FIGURE LEGENDS

Figure 1: Methodological process used to summarize existing training methods and to collect pharmacists and students' needs

Figure 1: Méthodologie de recueil des données (méthodes de formation existantes et besoins exprimés des pharmaciens et internes)

Figure 2: Analysis of the residents' opinions on the training session

Figure 2: Analyse des opinions des internes sur leur formation aux gardes

Figure 3: Distribution of hospitals which answered the Google form® survey intended to French pharmacy residents

Figure 3: Répartition des établissements hospitaliers pour lesquels une réponse a été obtenue au questionnaire national Google form® sur les gardes des internes en pharmacie

Figure 4: Results of the Google form® survey intended to French pharmacy residents: Pharmacy residents' on-call activities distribution (A), Types of training (B), Approximative duration of theoretical training (C), Approximative duration of practical training (D), Composition of theoretical training (E), Composition of practical training (F)

Figure 4: Résultats de l'enquête nationale Google form® sur les gardes des internes en pharmacie : activités réalisées en garde (A), méthodes de formation (B), durée approximative des formations théoriques (C), durée approximative des formations pratiques (D), contenu des formations théoriques (E), contenu des formations pratiques (F)

Figure 5: Methodological process used to elaborate the training program

Figure 5: Méthodologie utilisée pour élaborer le programme de formation

Figure 6: Composition of the training program

Figure 6: Mise en oeuvre du programme de formation



September  
2016

- Distribution of the national survey to the 25 French pharmacy residents' associations

November

- Analysis of the national survey's results with the software Excel®

December  
2016

December  
2016

- Distribution of the local survey to the 10 senior pharmacists of our hospital

February-  
March  
2017

- Analysis of the local survey's results with the software Excel®

July-  
August  
2017

- Collect of the pharmacy residents' opinions in our hospital and analysis of results with the software Excel®



### **Theoretical training**

- Training focused on situations that residents can deal with during on-call duties
- Existence of paper issues, paper-based support, flowcharts...
- Clarity and precision of some trainings
- Presence of concrete examples
- Some trainings done on computers: it enables them to practice the software usage
- Visit of the pharmacy
- Detailed correction of the evaluation of knowledge (Drug dispensation) with all the residents

### **Practical training**

- Realization of the training with the pharmaceutical assistants in the activity sector
- Manipulation of the software
- Training realized in small groups/individual training
- Companionship between experienced and novice residents
- Realization and control of their own pharmaceutical preparations

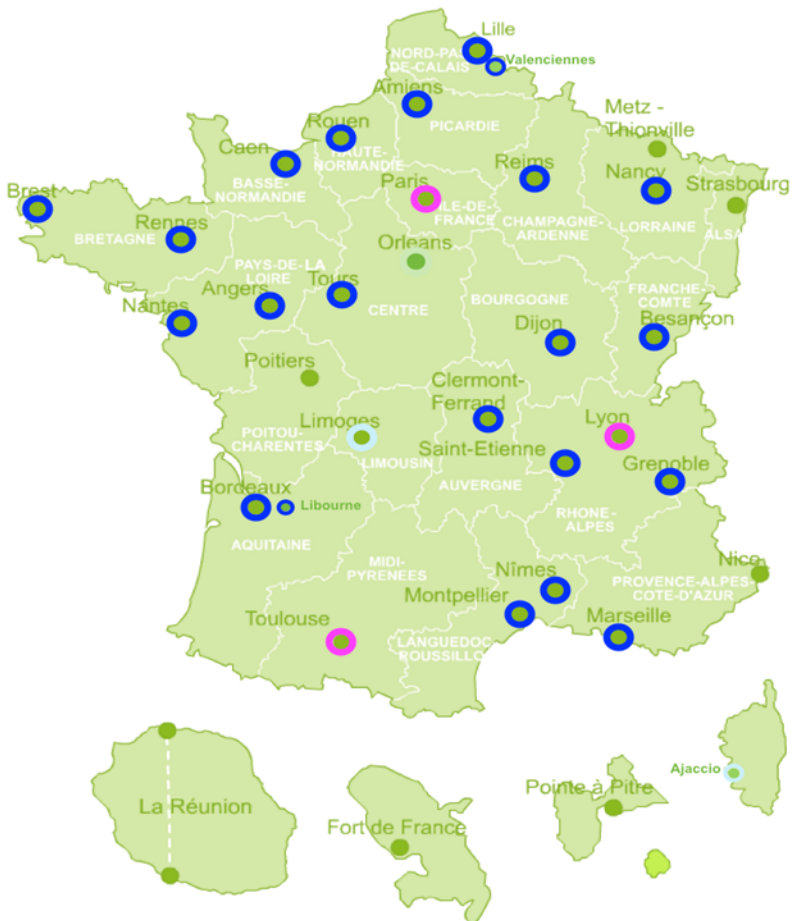





### **Theoretical training**

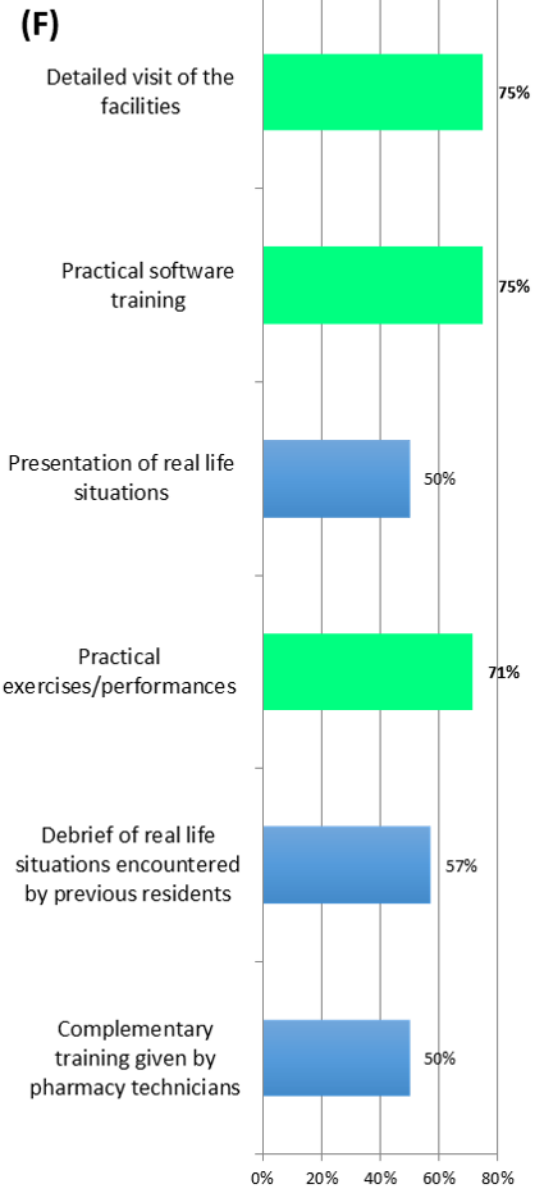
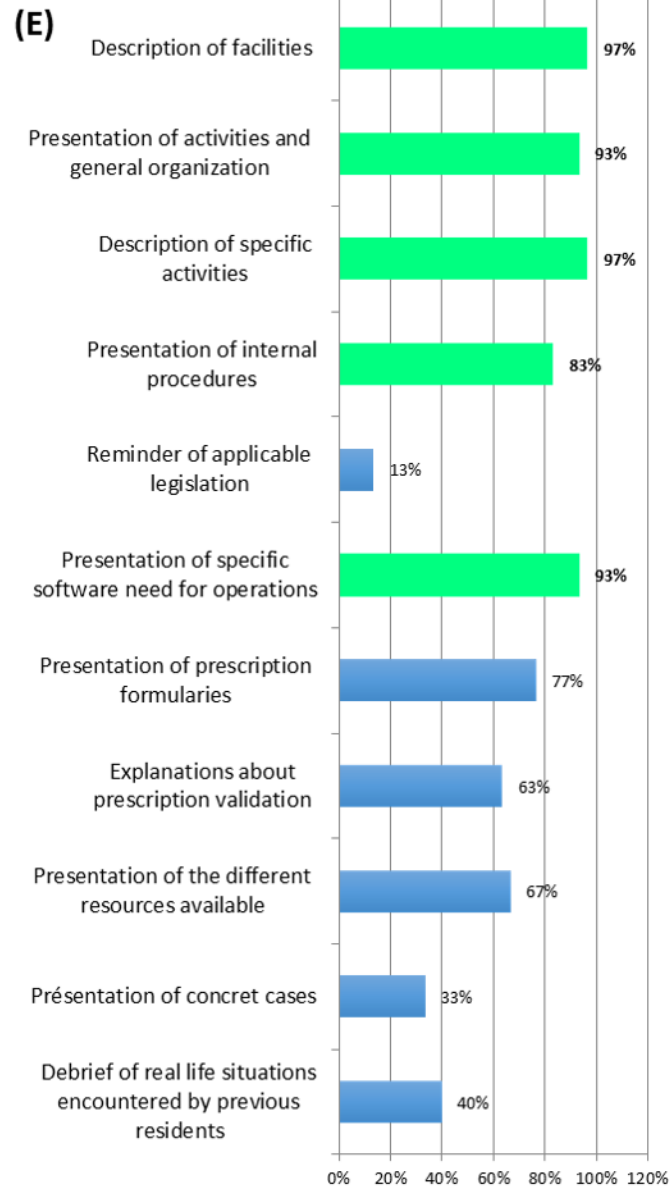
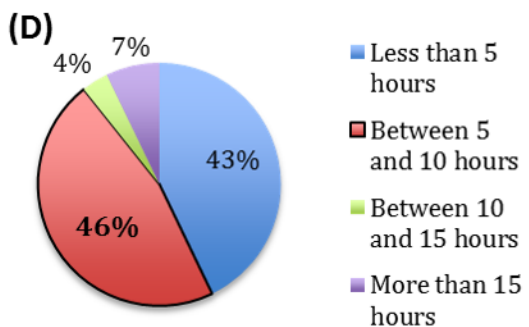
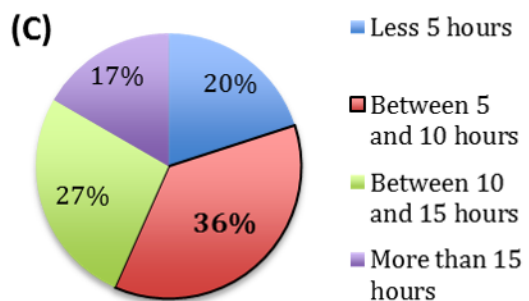
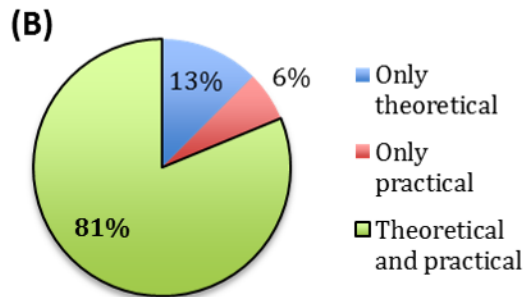
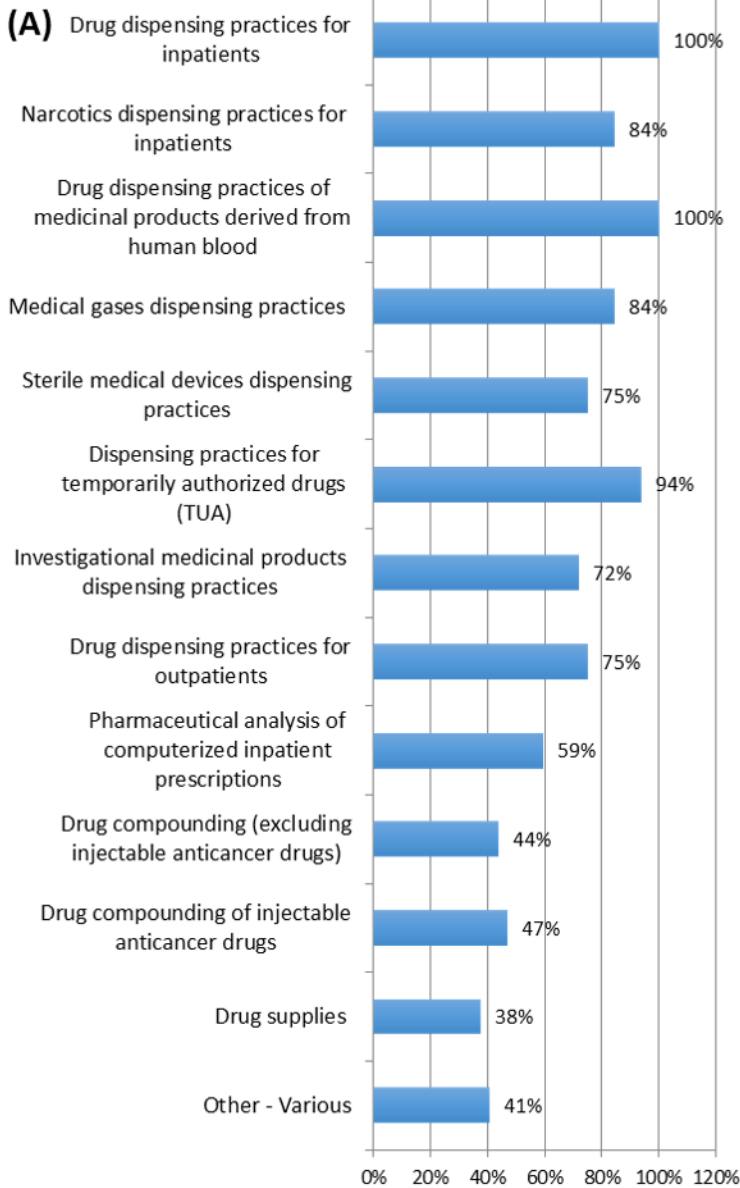
- Presentation of the hospital and the pharmacy, explanations on the drug's circuit...
- More concrete training and practical cases
- Introduction of e-learning and simulation
- More issues paper about real-life situations
- A repertory of sensitive situations
- Explanations about the different storage places of drugs, pharmaceutical preparations and raw materials
- Oral and/or practical knowledge assessment
- Reiterate the training in the semester

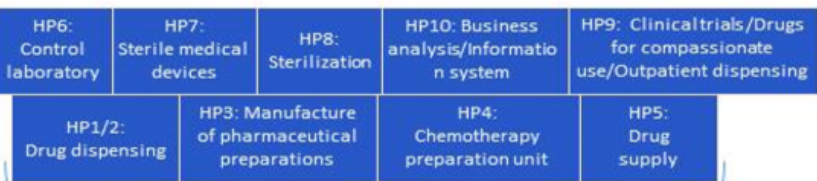
### **Practical training**

- Extend the duration of the practical training
- Reiterate the training in the semester
- Optimize the organization of the training
- Update some protocols
- More ride-along, more concrete examples and examples about requested actions in some particular situations
- A repertory of mistakes to avoid
- Practical knowledge assessment
- Other supports requested: simulation, "real life" case studies and paper-based support

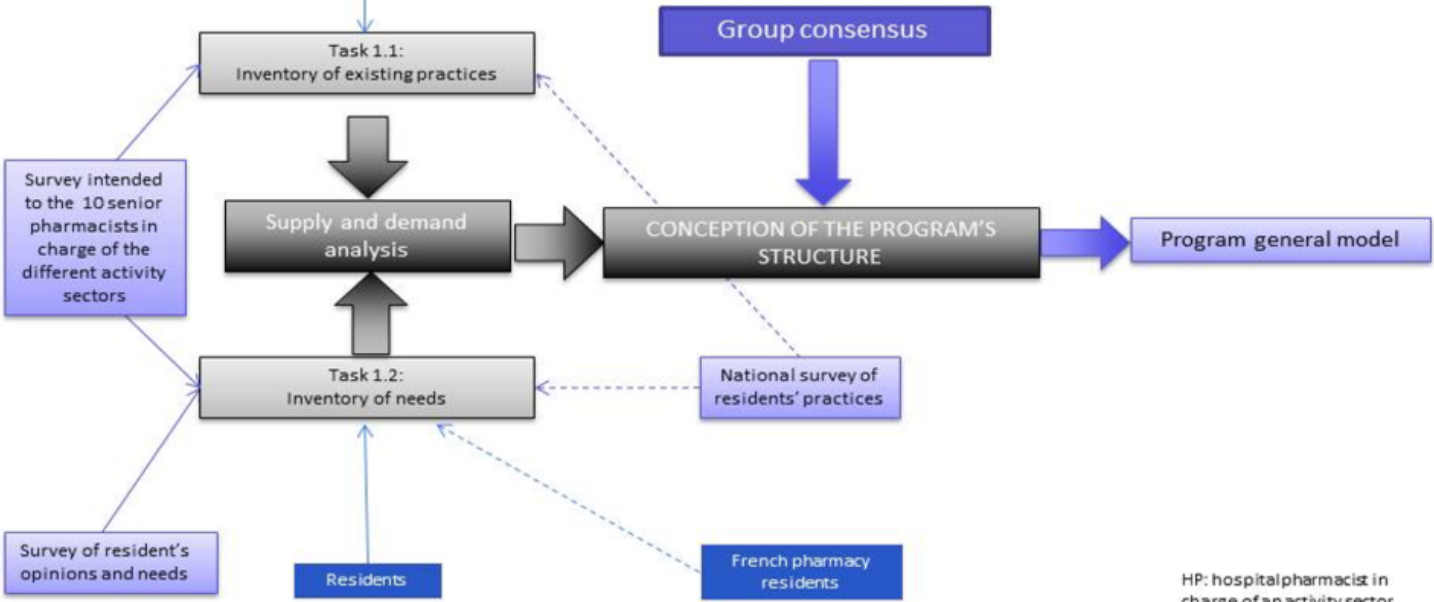


-  Cities where 1 hospital answered
-  Cities where several hospitals answered
-  Cities where 1 hospital answered whose organization is not considered as an on-call duty





# Task 1 : Conception of program general model



HP: hospital pharmacist in charge of an activity sector

HP 6	HP 7	HP 8	HP 9	HP 10
HP 1	HP 2	HP 3	HP 4	HP 5

Group consensus

#### Task 4 : development of training evaluation tools

Task 4.1:  
E-learning

Task 4.2:  
Continuous on-site evaluations

HP 6	HP 7	HP 8	HP 9	HP 10
HP 1	HP 2	HP 3	HP 4	HP 5

Group consensus

Task 2.1:  
Harmonization of theoretical training materials

Task 2.2:  
Development of on-call duty notebook

Task 2.3:  
Transversal training session for general on call activity and practical organization

Task 2.4:  
Implementation of experience sharing mini-sessions

#### Task 2 : conception of theoretical training tools

Program general model

Theoretical and practical training tools

Task 3.1:  
Choice of simulation models

Task 3.2:  
Implementation of simulation workshops

Task 3.3:  
Optimization of companionship between residents

#### Task 3 : conception of practical training tools