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Sommaire

Le docteur Michel Welter et la Grande Guerre

par Raymond Schaus

La Grande Guerre au Luxembourg. Le Journal de Michel Welter. 3 août 1914 - 3 mars 1916. Edition annotée et commentée par Germaine Goetzinger. Centre National de littérature, Mersch (Luxembourg), 2015, 556 pages. 45,00 €.

Le plaisir commence dès que l'on tient en mains ce livre de robuste facture. La couverture en toile de lin bleu cobalt flatte d'emblée le regard et le toucher. Mettre de côté l'omniprésente et obsédante tablette électronique pour se saisir de ce volume, c'est comme tourner le dos à l'agitation de la rue pour pénétrer dans un château !

Le docteur Michel Welter, né en 1859 à Heiderscheid, s'installe comme médecin généraliste d'abord à Esch-sur-Alzette en 1886, puis à Luxembourg-Hollerich en 1900. Le virus de l'action publique s'empare de sa personne à mesure que croît sa sollicitude pour les petites gens et les „damnés de la terre" faisant appel à ses soins. Il est élu député en 1897. Le praticien en lui s'efface peu à peu, laissant la place au polémiste et à l'animal politique. Il cesse de consulter.

Extrait du purgatoire après une éclipse d'un siècle, son Journal apparaît au grand jour grâce à l'esprit d'initiative et à la persévérance de son petit-fils, le docteur Roger Welter, qui a lui-même maintes fois troqué le bistouri contre la plume pour contribuer à enrichir la littérature chirurgicale. L'édition se fonde sur les douze carnets manuscrits originaux de son grand-père.

Le „docteur rouge" est un socialiste convaincu et effervescent, l'ami de la classe ouvrière, la bête noire des libéraux, la cible préférée de la haine des cléricaux. Il s'engage surtout en faveur de la législation sociale (assurance maladie, congés payés, logements des ouvriers). A propos d'efforts pour la paix, il n'hésite cependant pas à parler des „socialistes et d'autres utopistes". Le vote des crédits de guerre par les socialistes allemands est perçu par lui comme un traumatisme. „Les prolétaires de tous les pays se sont unis, mais unis sur les champs de bataille...partout ils s'unissent, s'égorgent et s'étranglent et leur sang se mélange fraternellement..." . Le chemin est court du rêve à l'amertume.

L'occupation

Le 2 août 1914, les „Prussiens" violent la neutralité du Luxembourg et en commencent l'occupation. Michel Welter écrit le 3 août: „Aujourd'hui que le pays est envahi par les troupes allemandes qui le traversent pour aller à la rencontre de l'armée française, tout le monde a la triste certitude qu'il est fini le Grand-Duché de Luxembourg libre et indépendant." Et plus loin:

„On a le sentiment qu'en peu de jours, une époque historique prend fin ou plutôt qu'elle a déjà pris fin, et qu'une nouvelle ère commence."

Les thèmes qui se partagent ces pages sont la violation de la neutralité du Luxembourg par les Allemands, les conséquences de l'occupation, la guerre elle-même et la politique intérieure luxembourgeoise.

Le destin inflige au Luxembourg quatre années extrêmement dures.

L'occupant militaire d'outre-Moselle y cohabite avec le pouvoir civil luxembourgeois qui reste en place. Chambre des députés et gouvernement continuent à fonctionner. La différence est sensible avec la situation que le second viol perpétré par les Allemands en 1940 réservera au pays. L'angoisse étreint cependant les Luxembourgeois exposés à un conflit dont l'issue restera longtemps incertaine et qui s'avérera une des cassures dans l'histoire de l'humanité.

Les dirigeants grand-ducaux estiment devoir ostensiblement se cramponner au respect de la stricte neutralité stipulée par le traité de Londres de 1867. Le diariste reproche à Paul Eyschen, président du gouvernement, sa „mollesse envers les autorités allemandes." La Grande-Duchesse Marie-Adélaïde ne se fera jamais pardonner l'accueil prévenant voire amical qu'elle réserve à l'empereur Guillaume II c'est-à-dire à l'agresseur, un pénible détail entachant l'histoire de notre monarchie.

L'infrastructure ferroviaire luxembourgeoise est un atout, une pièce maîtresse dans le jeu des stratèges du Kaiser. Des convois de troupes destinées au combat et du matériel de guerre transitent jour et nuit par la gare de Luxembourg en direction du front, ce qui indispose évidemment les Alliés. Permissionnaires et blessés refluent en sens inverse.

Les Alliés en veulent au Luxembourg de ne pas s'être défendu comme l'a fait, héroïquement, la Belgique du Roi Chevalier. Ils en déduisent l'existence d'un sentiment germanophile, que dément pourtant l'attitude quasi unanime de la population. Celle-ci, abhorrant la marée tudesque, prend fait et cause pour la France. La francophilie connaît ses plus beaux jours. La victoire de la coalition alliée est ardemment désirée.

Michel Welter suit de près au fil des jours les péripéties des opérations militaires sur les fronts franco-belges et de l'est. Son information laisse à désirer, il en est pratiquement réduit à éplucher les journaux luxembourgeois ou allemands, c'est-à-dire une presse respectivement censurée, muselée et au service de la propagande allemande. Les bulletins de guerre mensongers pleuvent. Les „faiseurs de nouvelles" ne chôment pas, les racontars et les rumeurs vont bon train.

Le grondement du canon

A chaque page retentit le bruit du canon, lugubre refrain en provenance de Verdun. „Ce sont toujours à des intervalles réguliers et très courts des roulements et des grondements entremêlés de coups secs qui se suivent sans discontinuer."

Le pays est donc occupé, mais l'affrontement des armées lui est épargné. Il vit en marge de l'affreuse boucherie. Les blessés de guerre des deux camps affluent, sont soignés à Luxembourg et assurent le contact le plus direct avec le carnage. L'accueil des fugitifs est une tâche quotidienne.

Harcelés par les vexations, les brimades, les exactions et les arrestations de la part de l'occupant, les habitants sont tenaillés par deux préoccupations principales: comment se procurer de la nourriture - car les vivres, notamment le pain, se font rares et les prix flambent - et comment imaginer l'avenir, une fois le conflit terminé et la paix rétablie. En cas de victoire allemande, le Luxembourg risque de se retrouver Bundesland avec Marie-Adélaïde comme Bundesfürstin; si les Alliés gagnent la guerre, l'annexion par la France ou la Belgique se profile comme une possibilité, car les convoitises ne font pas défaut ni les griefs inquiétants.

La politique locale suit son cours malgré la pesante et encombrante présence feldgrau. Le lecteur pressé survolera les pages qui la détaillent (conflit de l'Église et de l'État, etc.), en s'arrêtant aux faits saillants, aux anecdotes, aux épisodes marquants de la foire d'empoigne entre socialistes, libéraux et cléricaux. „On ne pourra pas se figurer que nous vivions au jour le jour, ayant nos grandes et nos petites miséres, nous chamaillant pour des bagatelles, occupés de nos affaires journalières, comme si à une cinquantaine de kilomètres il n'y avait pas des centaines de milliers d'hommes qui s'entretuent et s'entre-égorgent." Et encore: „Nous vivions impassibles et indifférents comme dans le meilleur des mondes."

Michel Welter ne cache pas qu'il ne porte pas la Cour dans son coeur. „N'est-ce pas singulier que les représentants du peuple restent debout quand la Souveraine est assise? Une souveraineté vaut bien l'autre..." La Grande-Duchesse Marie-Adélaïde est pour lui une „pauvre enfant...entêtée" , obligée de s'occuper de la politique „dont elle ne comprend rien" et dont les pas sont étroitement guidés par ses conseillers cléricaux, son confesseur non exclu, mais elle est „comme toujours, très aimable."

Les relations entre Welter et le président du gouvernement Paul Eyschen sont difficiles. Il estime irremplaçable (le décès inopiné d'Eyschen inaugurera la preuve irréfutable du contraire) cet „homme singulier", au jugement „sûr et droit...d'un talent supérieur et d'une intelligence hors ligne", mais qui „manque de caractère et de fermeté...Je le traitais toujours avec méfiance...il ne m'aimait pas", conclut sèchement Welter, la réciproque ne faisant pas l'ombre d'un doute.

Le sort de Marcel Noppeney, écrivain dont on vient de commémorer le 150e anniversaire de la naissance, est plusieurs fois évoqué. Le nom du docteur Auguste Praum, fondateur et premier directeur du Laboratoire bactériologique de l'Etat, est souvent cité. Ces éminentes personnalités se dépensent sans compter au sein du Comité de secours aux Français et Belges victimes de la guerre.

Un des points forts du livre: la réflexion sur les causes de la Grande Guerre, à rapprocher des vues exprimées par Christopher Clark (dans The Sleepwalkers, 2012).

On est étonné de l'ampleur de la haine viscérale que les Allemands vouent à l'Angleterre. Et „il paraît qu'à Trêves on hait presque autant le Luxembourg que l'Angleterre."

Relevons une exceptionnelle fleur que l'humour fait éclore dans le terreau aride, cette remarque à propos de Henri Vannerus, ministrable: „Il n'a qu'un seul défaut qui s'aggrave de jour en jour: il est trop âgé."

Le docteur Welter s'exprime en français moyennant un vocabulaire nourri, dans un style de premier jet - son Journal n'était pas destiné à être publié. Plusieurs passages plus travaillés ou rédigés à des heures propices, laissent percer des dons d'authentique écrivain. La connaissance de l'allemand n'est donc pas exigée du lecteur, mais elle est un avantage (comme disent les offres d'emploi), permettant de profiter des citations et des importations faisant usage de cette langue.

Dans ce journal d'un médecin, les commentaires strictement médicaux sont rares, tout au plus est-il succinctement question des amputations auxquelles les chirurgiens français recourent plus souvent que leurs confrères allemands, ainsi que du „typhus" , de la dysenterie et du choléra apparaissant dans les deux armées. (On connaît de l'auteur un article scientifique publié en 1890 ici même c'est-à-dire dans le Bulletin de la Société des sciences médicales: Allgemeines über Infekionskrankheiten. Eine Studie).

La famine

Courageusement dévouée à une aventure éditoriale semée d'embûches, Germaine Goetzinger signe une dense introduction de 21 pages, brillant miroir où se reflètent les faits significatifs de l'époque et les forces qui les sous-tendent. La directrice honoraire du Centre de littérature de Mersch accole ici durablement son nom à celui de Michel Welter. Sans les notes qu'elle prodigue en bas de page, fruits d'un immense labeur, le texte serait difficilement lisible pour un lecteur d'aujourd'hui. Chaque nom propre, chaque désignation de lieu se voient agrémentés d' explications. Celles-ci volent même au secours de fonctions amnésiques quelque peu émoussées, rappelant entre autres que Tolstoï était un écrivain russe et que Napoléon Bonaparte perdit la bataille de Waterloo.

Mais ces annotations sont une source de culture générale pour tout le monde, une véritable aubaine. Des citations latines sortent de leur sommeil flanquées de leur traduction. Même un extraterrestre fraîchement débarqué comprendrait jusqu'au dernier mot et jusqu'au clin d'oeil le plus fugace.

Le choix judicieux d'illustrations d'époque et de qualité contribue à recréer l'ambiance d'un temps révolu. Les caricatures reproduites allègent l'atmosphère forcément lourde.

En 1916, le docteur Welter est appelé à faire partie du gouvernement d'union nationale où lui échoit le portefeuille de l'agriculture, du commerce et de l'industrie. Sans doute absorbé par ses responsabilités, il met le point final à son journal.

Les livres d'histoire renseignent sur la suite et la fin. La tâche du nouveau directeur général (= ministre) consiste surtout à assurer le ravitaillement de la population. Mission impossible, car la France, la Suisse et l'Allemagne refusent leur aide. Le succès se dérobe. En 1917 Michel Welter doit quitter le gouvernement. La classe politique n'abandonnant pas les siens, il obtient le poste de directeur du service médical de l'Établissement thermal de Mondorf-les-Bains. En 1920, il retourne à la Chambre des députés. Il n'est pas réélu en 1922, et décède en 1924 d'un accident vasculaire cérébral à l'âge de 65 ans.

Il n'est pas indifférent pour les Luxembourgeois, aujourd'hui, de connaître les tensions auxquelles, avant-hier, les fondements du pays ont été soumis. C'est aussi vrai pour leurs concitoyens qui n'ont pas grandi au grand-duché, mais qui maintenant y vivent et y travaillent. Mieux versés dans l'histoire de leur pays d'adoption, ils seront moins surpris par certaines idiosyncrasies des Luxembourgeois de souche qu'ils sont amenés à côtoyer.

Le docteur Michel Welter: disciple d'Esculape devenu paladin de la gauche ouvrière, en proie au démon de l'écriture, en butte aux convulsions d'une époque mouvementée qu'il regarde lucidement en face. Voilà confirmée sa place au milieu de l'histoire de la Première Guerre mondiale dans la perspective luxembourgeoise.

Retrospective analysis of cardiac events during cardiac rehabilitation at Centre Hospitalier de Luxembourg during 2014 and 2015

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Abstract:

Background: The benefits of cardiac rehabilitation are well accepted. However, there still remains a debate concerning the risk of cardiac events, especially arrhythmias, during exercise training. The goal of the study was to retrospectively analyze events, including arrhythmias, in the cardiac rehabilitation unit of the Centre Hospitalier de Luxembourg during 2014-2015 and to identify if there was a link between patients stratified as high-risk patients and events. Methods: This analysis included each patient that participated in cardiac rehabilitation at the Centre Hospitalier de Luxembourg during 2014 and 2015. Major and minor cardiac events during exercise training in this period were retraced by retrospectively looking at patient files. These events were related to the potential risk of the patients, assessed by the "Risk stratification for cardiac events", edited by the American Association of Cardiovascular and Pulmonary Rehabilitation.

Results: 628 patients were recruited for cardiac rehabilitation at the Centre Hospitalier de Luxembourg during 2014 and 2015. They exercised for a combined total of 15065 training hours. There were no major cardiac events during exercise training in this period; the number of minor events was low (n=24; 1 minor event/628 training hours). About two thirds of our patients are considered as low risk patients, one third of the patients were at intermediate or high risk. We found no relationship between events and risk stratification. Conclusion: There were no major cardiac events in our patients and the rate of minor cardiac events was low and not related to risk stratification.

Keywords:

cardiac rehabilitation, risk of cardiac events, arrhythmias, high-risk patients

Introduction:

Systematic cardiac rehabilitation was started in the 1960s, first as an adjunctive treatment for stable patients with coronary artery disease (CAD). During the following decades, its indications have been extended to patients after bypass and valve surgery. Later in the 1990s, patients with advanced chronic heart failure (including cardiac transplantation and left ventricular assist devices), and recently patients treated with transcatheter aortic valve implantation (TAVI) or transcatheter mitral repair, have been included.

The benefits of cardiac rehabilitation are multiple: reduction in mortality, reduced rate of hospitalization (in chronic heart failure), increased exercise capacity and quality of life (1-5). It is a main component of secondary prevention programs since it helps control risk factors like diabetes, hypertension, hypercholesterolemia, obesity and inactivity. In the early 2000, numerous studies have shown direct beneficial effects on endothelial function and inflammation markers, indicating that exercise training not only improves risk factors, but also partially counteracts some of the pathophysiological mechanisms of atherosclerosis (6).

Despite those positive effects, there is still a concern that exercise might also induce or trigger cardiac events. This fear is probably related to ancient case reports and to the fact that in men without known cardiac disease and with a low level of habitual exercise, the incidence of sudden cardiac arrest is increased during vigorous exercise. On the other hand, it should be noted that regular exercise decreases the risk of cardiac arrest during vigorous exercise (7,8). Thus not only the positive effects of cardiac rehabilitation but also its safety should be assessed.

In-hospital cardiac rehabilitation at the Centre Hospitalier de Luxembourg has been initiated 20 years ago. With the introduction of a new, easy wearable 1 lead ECG recording system in the end of 2013, we started to systematically record events and new onset of cardiac arrythmias. Our goal was to get better knowledge of the rate and kind of events that occurred in our centre and to analyze whether patients labeled as “high risk” patients presented more frequently cardiac events. The present study reports the data recorded during 2014 and 2015.

Methods:

Population:

Each patient that was admitted to the cardiac rehabilitation unit of the Centre Hospitalier de Luxembourg and performed training sessions during the year 2014 and/or 2015 was included in this retrospective analysis. There were no exclusion criteria.

Training sessions:

Each patient performed an individualized training program. Training frequency varied between 2 and 3 sessions weekly, training intensity was moderate to vigorous and was either determined by heart rate or, in some cases, by rate of perceived exertion. Minimum target amount of endurance exercise was 30 minutes and resistive strength training was added in each patient who did not present orthopedic (or other) limitations.

Recording of cardiac rhythm:

All the patients participating in the cardiac rehabilitation program wore a portable 1 lead ECG belt around the chest (Custo med GMBH, Ottobrunn, Germany) allowing to continuously monitor, record and store ECG during training sessions.

Risk of Cardiac Event stratification during cardiac rehabilitation:

The potential risk for a cardiac incident during rehabilitation was stratified according to the "AACVPR (American Association of Cardiovascular and Pulmonary Rehabilitation) Stratification Algorithm for Risk of Event". Patients were considered at low risk after uncomplicated myocardial infarction (MI), coronary artery bypass graft (CABG), angioplasty or stenting, if their Left Ventricular Ejection Fraction (LVEF) was over 50%. There had to be an absence of complex ventricular dysrhythmias at rest or during exercise and a normal hemodynamic and ECG response with exercise and in recovery. They had a maximal functional capacity of at least 7.0 METs* and there was no presence of clinical depression or depressive symptoms. Patients were considered at moderate risk if LVEF was between 40–50%, if they presented signs/symptoms including angina at "moderate" levels of exercise (60–75% of maximal functional capacity) or during recovery. Patients were considered at high risk if LVEF was < 40%, if they were survivors of cardiac arrest or sudden death, had known episodes of complex ventricular dysrhythmias (ventricular tachycardia, frequent [> 6/min], multiform PVCs) at rest or with exercise, had MI or cardiac surgery complicated by cardiogenic shock, chronic heart failure (CHF), and/or signs/symptoms of post-procedure ischemia, abnormal hemodynamics with exercise, especially flat or decreasing systolic blood pressure or chronotropic incompetence with increasing workload, had signs/symptoms including angina pectoris, dizziness, lightheadedness or dyspnea at low levels of exercise (< 5.0 METs) or in recovery, had a maximal functional capacity less than 5.0 METs* or a clinically significant depression or depressive symptoms.

Cardiac Events:

Cardiac events were classified into 2 categories: major and minor adverse cardiac events. Sudden cardiac death, MI, acute heart failure, stroke and appearance of malignant ventricular arrhythmias were considered as major cardiac events, whereas stable exercise-induced angina, new onset of supraventricular arrhythmias or conduction disorder, syncope, vagal episodes, dizziness and episodes of hypotension were considered as minor cardiac events. These events were retraced by looking at the cardiac rehabilitation files of the patients. For every episode, where the rehabilitation team sought advice from the cardiologist, a written comment was systematically included in the patient file, facilitating the retrospective analysis.

In this study, we did not only look at events during exercise but we also recorded abnormalities that we detected at the beginning of the training session, where cardiovascular parameters (eg heart rate and blood pressure) were systematically measured and patients were questioned if they met any particular problems in between sessions.

In case of new onset of cardiac arrhythmias, exercise was stopped and a cardiologist analyzed the ECG recording. If needed, 12 lead ECG was subsequently added to determine the exact nature of the arrhythmias.

Data collection:

Data concerning biometric variables of the patients (height, weight) were recorded during anamnesis; risk factors, diagnosis, cardiac function (used for risk stratification), previous history of arrhythmias were collected from the cardiologic report patients received at the discharge from the hospital.

Statistics:

Statistical analysis was performed with the help of the XLSTAT® software. Descriptive statistics were presented as mean and standard deviations. Correlations were used to study the relationship between different parameters.

Results:

Population:

During 2014 and 2015, 628 patients were enrolled in the cardiac rehabilitation program of the Centre Hospitalier de Luxembourg. 78,7% of these patients were male, 21,3 were female. Age, height and weight and body mass index (BMI) are presented in table 1.

Diagnosis:

Most of the patients referred for cardiac rehabilitation had a diagnosis of acute coronary syndrom (ACS) or cardiac surgery (39 and 37 % respectively), followed by chronic heart failure. "Other" diagnoses were, amongst others, TAVI, deconditioning, rhythmic disorders cleared for exercise training. 7 patients were rehabilitated after cardiac transplantation (3) and LVAD (4).

Risk factors:

In 54 of our patients, risk factors were either not present or not reported in the discharge report. Most of the patients presented either 2 or 3 risk factors (51,2%). Number and nature of risk factors are presented in table 1. The most prevalent risk factor was hypercholesterolemia, followed closely by hypertension. 26% were diabetic patients, on medical treatment. 41% of our population was sedentary, 30 % were active smokers at the time of their cardiac event (table 1).

Stratification for risk of event:

Stratification for risk of event, based on the patient discharge report or exercise testing could be determined in 577 out of 628 patients. 65,7 % of the evaluated patients were categorized as "low risk", 16,1% as "intermediate risk" and 18,2 % as "high risk"(table 1).

History of cardiac arrhythmias:

We also screened patients if they already presented previous episodes of arrythmias; we found 104 cases of paroxystic or permanent supraventricular arrythmias, 18 cases of serious conduction disorders (left or right brandle blocs and 1st degree AV blocs were not considered in this statistic) and 25 cases of episodes of ventricular arrhythmias. Some patients presented several types of arrhythmias (table 2).

Training sessions/hours:

We analyzed the total number of training sessions that were executed by our patients in 2014 and 2015. The total number of session was 15065. We considered that the average time of a training session was approximately 1 hour, so we calculated a total amount of training hours of 15065. The average number of rehabilitation sessions per patient was 24 sessions.

Cardiac Events:

There was no major cardiac event during or immediately after exercise training in our cardiac rehabilitation unit in 2014 and 2015. During this period, 24 episodes of minor events occurred (table 2): 4 patients developed angina during exercise (1 patient had a subsequent angioplasty, in 2 others, medical treatment was adapted), 2 patients had an important increase of dyspnea during exercise (in one patient, pleural effusion was detected, in the other this episode of dyspnea resolved spontaneously), 7 patients developed supraventricular arrhythmias (mostly rapid atrial fibrillation), in 4 patients exercise induced conduction disorders (AV blocs with subsequent exercise intolerance or dizziness), 3 patients suffered from hypotension between exercises and 2 presented hypotension episodes immediately after the training session. One patient had vision troubles during treadmill exercise; this episode was considered as a probable transitory embolism.

As already mentioned, we also examined events that we detected at the beginning of the training session. No major event was detected, minor events were: 6 cases of severe hypertension, 15 cases of new onset of supraventricular arrythmias, 2 patients described angina like symptoms during the days between the training session, they were referred to the cardiologist for further investigations (in the first, an angioplasty was performed, in the second, medical treatment was adapted). One patient was severely out of breath at the beginning of the session (due to severe anemia), one patient had fever and was hospitalized for an infectious episode and finally, on patient was lethargic. An adjustment of his medical treatment solved his condition.

Correlations:

In our population there was no correlation between (minor) cardiac events and age, neither between number and origin of risk factors nor risk for cardiac event stratification. The only significant correlation that we found was between minor cardiac events and previous history of arrhythmias ($r=0,145$; $P<0,0001$).

Discussion:

The main result of our study showed that cardiac rehabilitation at the Centre Hospitalier de Luxembourg was safe as there was a very reduced number of minor cardiac events (1 per 628 training hours). No major cardiac events occured during 2014 and 2015.

This confirms data from other studies or registries. A french registry, published in 2006 by Pavy et al. (9), analysed events in 25420 patients from 65 different cardiac rehabilitation centres. They calculated one major cardiac incident per 49565 training hours. Data published by the Amercican College of Sports Medicine in 2010 (10) found one major event per 81670 training hours. Lear et al. (11) found in their review, between 1,23 and 2,88 major events and between 0,13 and 0,88 lethal incidents per 100 000 training hours during cardiac rehabilitation. They also showed that the more recent the registries, the lesser the number of events. In a nationwide survey in 136 cardiac rehabilitation centre in Japan (12), 4 lethal events occured in 383096 training hours. The registry of Van Camp et al. (13) compiled data of more than 4 years and over 2 million of training hours. They found 8,9 cardiac arrests, 3,4 myocardial infarctions and 1,3 cardiac deaths per 1 million training hours.

Rognmo et al. (14) studied risk and events during moderate and high intensity interval exercise in 4886 cardiac patients. They found one fatal cardiac arrest during sessions at moderate intensity (1 event par 129456 training hours) and two non fatal cardiac arrests during high intensity training (1 event per 23182 training hours). They concluded that the risk for major cardiovascular events during rehabilitation is low with moderate as well as high intensity training. In 2014, Pack et al. (15) published their registry of 240 patients participating in cardiac rehabilitation in between 2009 and 2013 after bypass or valve surgery. Only 41 minor incidents were reported.

Iliou et al. (16) reported the rate of acute coronary syndrom during or within 1 hour of exercise training/testing in 3132 patients enrolled in rehabilitation after coronary angioplasty during 2013 : they found an incidence of 1.7 per 1 million hours of training.

The HF-Action study (17) was designed to study the effect of exercise training on mortality in chronic heart failure patients. Safety of training was also assessed. In 1159 patients trained three times/week for 12 month, 37 patients were hospitalized within 3 hours after training sessions. The reasons for those hospitalisations were : angina pectoris, syncope or pre-syncope, hypoglycemia or arrythmias. Belardinelli et al. (18) presented their resuls of 10 years of cardiac rehabilitation in chronic heart failure patients as well. Their rate of cardiac events was low, only 8 of 63 patients they followed for

10 years, were hospitalized during that period for worsening of their heart failure and all could be discharged form hospital after adaptation of medical treatment.

Vanhees et al. (19) assessed safety of cardiac rehabilitation in patients implated with cardiac defibrillators (ICD). 4 out of 92 patients recieved an adequate shock during 12 weeks of rehabilitation whereas 6 shocks occured in daily life during the same period.

We did not systematically include in our database if patients were implanted with ICD, however, there is an increasing number of patients implanted with ICD participating in our cardiac rehabilitation program. So far, none of our patients recieved a shock during a training session.

Even if the number of training hours in our study is much smaller than those of some of the larger registies presented above, we may conclude that our results are in line with the data from those studies ; exercise training during cardiac rehabilitation is safe, major incidents are exceptionnel (none in our case), moderate and even high intensity training seem equally event-free and results do not really differ if all type of cardiac patients have been mixed up (large registries) or if specific population like CHF patients or patients with ICD have been studied.

Another incentive for our restrospective analysis had been to determine if these events were related to the risk stratification, meaning that low risk patients have less events and high risk patients have more events. Since we did not have any major event, we cannot conclude on a relationship with risk stratification. On the other hand, we found that there was no relationship between minor events and risk stratification. This information is of practical use ; it would be erroneous to think that an apparently low risk patient would not need the same accuracy in surveillance than a high risk patient and it migth not be necessary to « overprotect » high risk patients.

Some studies suggest that cardiac events migth be more frequent in aged patients (>65 years) or in patients with an accumulation of cardiac risk factors. We did not find any relationship between those parameters and events in our population.

However, we could show that patients were more likely to have minor events during exercise training if they had a previous history of arrythmias. To our knowlegde, the different registries have not looked at this relationship and this should be investigated in larger populations, especially since Ohzan et al. (20) showed that atrial fibrillation was an independant predictor of cardiovascular events in a non exercising population.

Conclusion :

Cardiac rehabilitation at the Centre Hospitalier de Luxembourg proved to be safe, with no major event and only a few minor events in over 15000 training hours. Stratification for risk of event did not seem to be a good predictor for minor cardiac events.

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Table 1: Demographics, indications for cardiac rehabilitation, risk factor profile and Stratification for Risk of Event of the studied population

Patients (n =)		
Total	628	
♀	134	21,3%
♂	494	78,7%
Patients		
Age (years)	62.7 ± 13.0	
Heigth (m)	1,85 ± 2.75	
Weigth (kg)	82.8 ± 17.0	
BMI	27.8 ± 4,9	
Patients characteristics ♀		
Age (années)	64,6± 13.5	
BMI	27.9± 6,1	
Patients characteristics ♂		
Age (années)	62.1± 12,9	
BMI	27.8± 4.6	
Age bracket (number and percentage)		
<30 ans	5/628	0.8%
30-40 ans	17/628	2.7%
40-50 ans	73/628	15.9%
50-60 ans	148/628	23.6%
60-70 ans	173/628	27.5%
70-80 ans	159/628	25.3%
>80 ans	53/628	8,4%
Diagnosis (number and percentage)		
Acute coronary syndrom	245/628	39%
Cardiac surgery	234/628	37,3%
Chronic heart failure	89/628	14,1%
Cardiac transplantation/ LVAD	7/628	1,1%
Others	53/628	8,4%
Risk factors (number and percentage)		
undetermined (or no risk factor)	54/628	8.6%
1	98/628	15.6%
2	156/628	24,8%
3	166/628	26,4%
4	88/628	14,0%
5	49/628	7,8%
6	17/628	2.7%
Smoking	170/574	29,6%
Hypertension	344/574	59,9%
Diabetis	147/574	25,6%
Hypercholesterolemia	369/574	64,3%
Physical inactivity	238/574	41,5%
Obesity (BMI>30)	196/574	34,1%
Familiar history	199/574	34,7%
AACVPR stratification for risk of event	**(number and percentage)**	
Low risk	379/577	65,7%
Moderate risk	93/577	16,1%
High risk	105/577	18.2%

Table 2: History of previous arrhythmias, number of training hours, major and minor cardiac events during and at the beginning of training session in the studied population

History of arrythmias (n=)		
Conduction disorders	18	
Supraventricular arrythmias	104	
Ventricular arrythmias	25	
Total training sessions / hours	**15065**	
Events during training sessions (number and rate / training sessions)		
Minor	24	1 per 628 training sessions
Major	0	
Events detected at beginning of training session (number and rate / training sessions)		
Minor	26	1 per 579 training sessions
Major	0	

Promotion of physical activity in patients with non-communicable diseases in Luxembourg: a follow-up of the Sport-Santé inventory from 2014

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Keywords:

physical activity, sport, lifestyle, prevention, chronic diseases.

Abstract

Regular practice of physical activity (PA) has many health benefits in both healthy individuals and in people with non-communicable diseases (NCDs). In order to disseminate this evidence and to strengthen the promotion of PA in people with NCDs, the Sport-Santé project was created in Luxembourg and officially launched in April 2015. In 2014, a stocktaking of the different organizations offering PA for people with NCDs was realized in order to develop the Sport-Santé project. Different communication tools were used to promote Sport-Santé as well as the aforementioned organizations. The present study aimed to re-evaluate the offers of PA for people with NCDs in Luxembourg one year after the launch of the project.

The organizations offering PA for people with NCDs (orthopaedics, obesity and overweight, neurology and rare diseases, oncology and cardiology) were screened in 2014 and in 2016. The number of weekly offered hours of PA for people with NCDs were collected and the participation rate was observed. Participants (192 in 2014 and 196 in 2016) volunteered to answer a survey, which contained questions regarding their age, sex, time since enrolment, travel distance, former and current PA participation, and type of recruitment. Additional items regarding prescription and refund were explored only in 2016.

In 2016, more than 55 hours per week of PA were offered for people with NCDs in Luxembourg (≈44 hours per week were identified in 2014). However, this increase was not statistically significant. No difference was observed between 2014 and 2016 regarding the participation rate (2014: 8.9 ± 5.1 participants per hour; 2016: 8.4 ± 5.7 participants per hour). Participants were younger in 2016 than in 2014. The time since enrolment was shorter in 2016 than in 2014. No difference between 2014 and 2016 was observed for travel distance, sex distribution, former and current PA participation, and type of recruitment. Participants were mainly recruited by the healthcare professionals. More than 69 % of the participants would like to receive a medical prescription for the PA. Fifty-two percent of the participants would appreciate a refund of the participation fees by their health insurance.

The increasing efforts of Sport-Santé and the organizations offering PA for people with NCDs lead to increase the offer. However, the participation rate remains unchanged. The decrease in age and in time since enrolment observed in 2016 could be explained by the creation of new activities, a larger participant's turnover or high number of withdrawals among long-term participants. Even if participants are mainly recruited by healthcare professionals, this type of recruitment can be attributed to very few idealists. All healthcare professionals should be aware of the offers of Sport-Santé and advise their patients to participate in a PA program. It is now time to advance the idea of prescription of PA as a privileged treatment option and to convince the policymakers to take action against sedentary behaviours in Luxembourg. Nevertheless, this type of promotion is not enough to increase the

number of participants and additional strategies must be explored and developed. The best sustainable strategies are always those that approach the problem from different viewpoints.

Introduction

Physical inactivity is one of the most important risk factors for non-communicable diseases (NCDs) [1-6]. NCDs include, but are not limited to, cardiovascular and chronic respiratory diseases, cancer, stroke and diabetes, and represent the leading cause of death in the world. Physical inactivity, which can be related directly and indirectly to other risk factors for NCDs (e.g. hypertension, smoking, hyperglycemia, overweight and obesity), induces more than 5 million deaths per year worldwide [1, 3, 4, 6]. This probably underestimated number of deaths must be prevented with behavioral changes. Premature death can be prevented by the decrease of physical inactivity [7]. Indeed, a decrease by 10% in physical inactivity will avert up to 1.3 million deaths per year and reduce the risk of premature death [6].

Physical activity (PA) is not only beneficial in terms of primary prevention of NCDs (e.g. weight control, lower risk for coronary heart disease, stroke, diabetes, hypertension, depression, colon and breast cancer etc.), but is also suitable in the context of already patent diseases (i.e. secondary and tertiary prevention). Indeed, it has a positive influence on the structures and functions of the body, on the course of disease and the relapse rate [3, 8]. People with NCDs can avoid the disease-related decrease of their quality of life by being more physically active. The increase in PA, combined with other behavioral changes (smoking cessation, decrease in alcohol consumption, healthier nutrition), can even contribute to an increase in life expectancy in people with NCDs [9]. Reduced exercise capacity is one of the most powerful predictors of mortality [10]. Indeed, studies demonstrated that a low cardiorespiratory fitness has a much worse impact on morbidity and mortality than smoking or obesity [2, 11]. Thus, despite the fact that obesity is a risk factor for NCDs per se, moderately fit obese persons have about half the mortality risk than normal-weighted unfit persons [11]. In patients with cardiovascular diseases (e.g. State after myocardial infarction), PA improves cardiac performance due to exercise-induced compensation mechanisms of the heart (e.g. increase of cardiac stroke volume, ejection fraction, improvement of the coronary circulation, etc.) and the vessels (endothelial function) [8, 12]. In cancer patients, PA reduces fatigue, anxiety and depression. In people with Parkinson's disease it improves mobility, coordination and reduces rigidity [8, 13-15].

The Sport-Santé project was created in Luxembourg in order to increase public awareness of the benefits of PA as a therapeutic adjuvant (i.e. disease specific recommendations for PA) and a means for health protection after an accident, as well as in secondary prevention of NCDs (i.e. cardiology, neurology and rare diseases, overweight and obesity, oncology, and orthopedics) [16]. With this idea

in mind, an inventory of the offers of targeted PA for people with NCDs was completed in 2014 [17]. This inventory highlighted that the participation rate was low and has potential to be improved. Different communication tools (website, posters, flyers, booths) were therefore developed and disseminated to inform specific stakeholders and the population about the existence of these targeted offers. The Sport-Santé project and its website were officially launched in April 2015. Our study aimed to re-evaluate the offers of PA for people with non-communicable diseases in Luxembourg one year after the launch of the project.

Materials and methods

Concerning the Sport-Santé project, the organizations offering PA for people with NCDs which were identified in 2014 [17] were re-evaluated in 2016. In addition, new organizations were identified in 2016 and one organization identified in 2014 wished to withdraw from the Sport-Santé project. The organizations are presented on the website www.sport-sante.lu [16] and have been classified into five categories: orthopaedics, obesity and overweight, neurology and rare diseases, oncology, and cardiology (Table 1).

Table 1. List of the observed groups offering PA for people with NCDs in 2014 and 2016.

Pathology	Association	2014	2016
Orthopeadics	1. Luxemburger Hüft- und Kniesportgruppe	✓	✓
	1st Return-to-Sports Group Luxembourg	×	✓
	Gesond Diddeleng	×	×
	Ligue luxembourgeoise contre le rhumatisme	✓	×
Obesity and overweight	Groupe Sportif Pour Adultes en Surpoids	✓	✓
	Groupe Sportif Pour Adolescents en Surpoids	×	✓
	Movin' Kids	✓	✓
	Gesond Diddeleng	×	×
Neurology and rares diseases	Parkinson Luxembourg	✓	✓
	Blëtz	×	×
	Multiple Sclérose Lëtzebuerg	✓	✓
	ALAN Maladies Rares	✓	✓
Oncology	Fondation Cancer	✓	✓
	Association Luxembourgeoise des Groupes Sportifs Oncologiques	✓	✓
	Europa Donna Luxembourg	✓	✓
Cardiology	Association Luxembourgeoise des Groupes Sportifs pour Cardiaques	✓	✓

✓: investigated group; ×: group not investigated.

The number of weekly offered hours of PA for people with NCDs was collected. In addition, the participation rate (i.e. number of participants per hour) was observed once in each category. During the periods from September 2013 to April 2014 and from February 2016 to March 2016, 192 (in 2014) and 196 (in 2016) participants volunteered to answer an anonymous questionnaire (Table 2) regarding their age, sex, time since enrolment (i.e. period of participation in the group), travel distance from home to sport facilities, former and current PA

participation and type of recruitment (healthcare professionals – i.e. medical doctors and allied health professionals – , family and friends, media and associations) [17]. In addition, the 2016 surveys included new items regarding the knowledge of the Sport-Santé project and whether participants would appreciate a medical prescription and/or a refund of the participation fees by their health insurance.

Table 2. Interviewed participants.

	2014	2016
	n (%)	n (%)
Orthopaedics	28 (14.6)	23 (11.7)
Obesity and overweight	17 (8.9)	35 (17.9)
Neurology and rare diseases	25 (13.0)	40 (20.4)
Oncology	46 (23.9)	36 (18.4)
Cardiology	76 (39.6)	62 (31.6)
Total	192 (100)	196 (100)

The data collected from 2014 were compared with those collected in 2016. Quantitative variables were expressed as mean and standard deviation (SD), and were compared by using Student's t-tests. The qualitative variables were expressed by number (n) and percentage (%) and were compared using the $\chi 2$-test. A 0.05 P-level of significance was set.

Results

In 2016, more than 55 hours of PA per week were offered for people with NCDs in Luxembourg (Figure 1). Compared to 2014, more than 11 hours of PA were new and resulted from the creation of new groups and activities. However, this increase was not statistically significant ($t = 2.53$, $P = 0.06$). In addition, no difference was observed between 2014 and 2016 regarding the average number of participants per hour (Figure 2). However, the participation rate dropped significantly in orthopaedics ($t = 6.98$, $P < 0.001$).

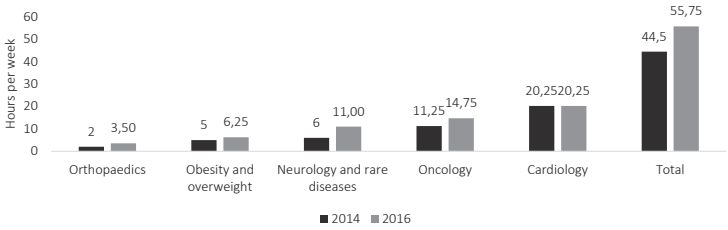

***Figure 1**. Number of hours per week of PA offered in 2014 and in 2016 for people with NCDs in Luxembourg.*

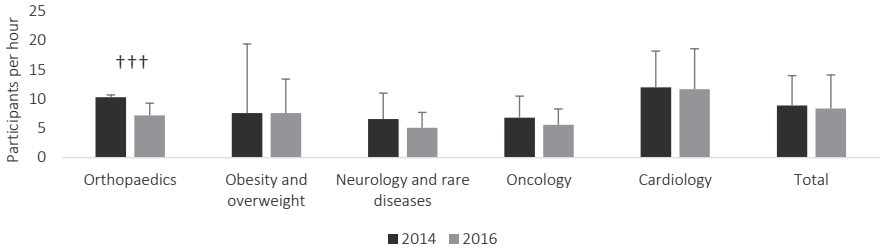

Figure 2. *Means (and standard deviations) of the participation rates observed in the five categories offering PA for people with NCDs in 2014 (black bars) and 2016 (grey bars). †††: P < 0.001.*

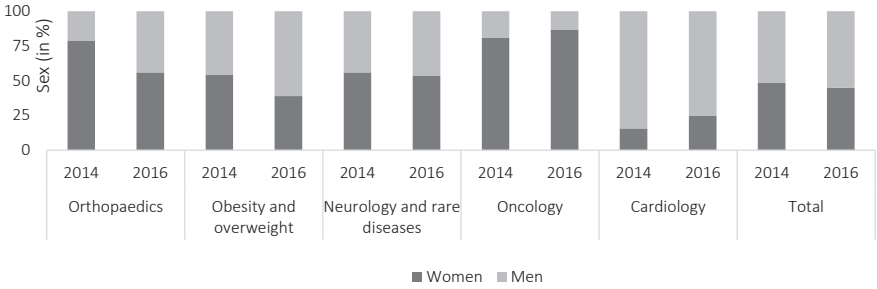

Figure 3. *Sex distribution (dark grey bars: women; light grey bars: men) observed in the five categories offering PA for people with NCDs in 2014 and 2016.*

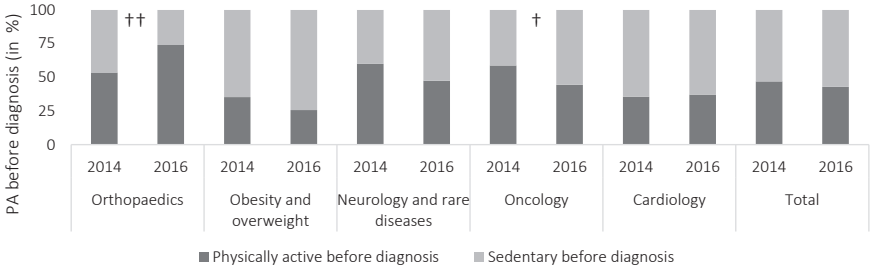

Figure 4. *PA before diagnosis (dark grey bars: physically active before diagnosis; light grey bars: sedentary before diagnosis) observed in the five categories offering PA for people with NCDs in 2014 and 2016. †: P < 0.05, ††: P < 0.01.*

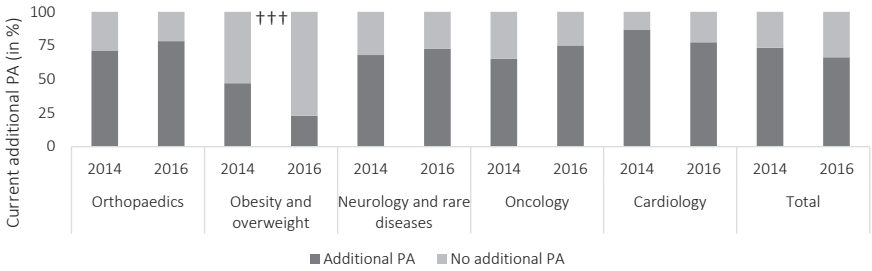

Figure 5. *Current additional PA (dark grey bars: additional PA; light grey bars: no additional PA) observed in the five categories offering PA for people with NCDs in 2014 and 2016. †††: P < 0.001.*

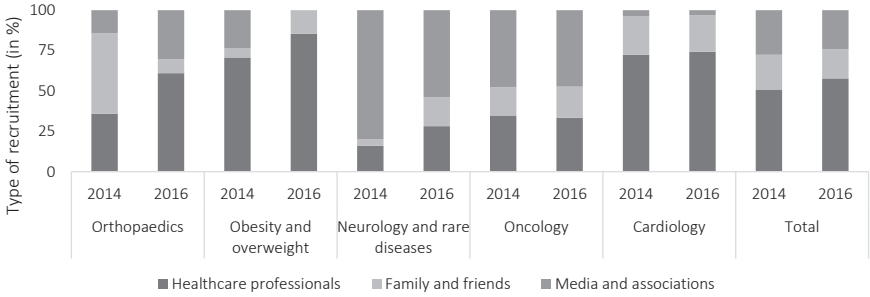

Figure 6. *Type of recruitment (healthcare professionals, family and friends, media and associations) observed in the five categories offering PA for people with NCDs in 2014 and 2016. ††: P < 0.01 for family and friends, ‡: P < 0.05 for the media and associations, ‡‡: for the media and associations.*

Table 3. Age, time since enrolment and travel distance (from home to sport facilities) observed in 2014 and 2016.

		2014	2016	t-test	
		Mean (SD)	Mean (SD)	t	*P*
Age	Orthopeadics	68.6 (8.7)	53.1 (17.1)	3.95	< 0.001
	Obesity and overweight	16.7 (3.9)	19.0 (14.5)	-0.87	0.38
	Neurology and rare diseases	45.9 (8.8)	58.6 (21.3)	-3.34	0.002
	Oncology	59.4 (8.7)	58.6 (9.7)	0.39	0.70
	Cardiology	6.3 (8.6)	65.3 (9.2)	0.65	0.51
	Total	58.2 (8.3)	53.2 (21.6)	3.02	0.003
		Mean (SD)	Mean (SD)	t	*P*
Time since	Orthopeadics	5.8 (4.5)	3.7 (3.8)	1.81	0.08
	Obesity and overweight	1.4 (0.5)	1.7 (1.3)	-1.19	0.24
	Neurology and rare diseases	2.3 (1.2)	2.1 (2.0)	0.50	0.62
	Oncology	3.6 (2.4)	4.0 (3.9)	-0.54	0.59
	Cardiology	7.8 (5.3)	6.8 (6.7)	0.96	0.34
	Total	5.3 (3.6)	4.0 (4.9)	3.00	0.003
		Mean (SD)	Mean (SD)	t	*P*
Distance	Orthopeadics	17.0 (8.9)	19.23 (10.3)	-0.81	0.42
	Obesity and overweight	3.8 (3.6)	10.75 (4.4)	-6.05	< 0.001
	Neurology and rare diseases	15.9 (8.8)	17.12 (9.5)	-0.53	0.60
	Oncology	16.9 (8.7)	15.85 (8.0)	0.57	0.57
	Cardiology	8.6 (5.8)	8.96 (6.4)	-0.34	0.73
	Total	12.2 (7.1)	12.92 (10.7)	-0.78	0.44

Table 3 shows the difference between 2014 and 2016 concerning age, time since enrolment and travel distance. Participants were younger in 2016 than in 2014, especially in Orthopaedics. In contrast, participants with neurologic and rare diseases were older in 2016 than in 2014. The time since enrolment (i.e. period of participation in the group) was shorter in 2016 than in 2014. Overall, no difference was observed between 2014 and 2016 for travel distance. However, the participants of the category obesity and overweight covered a significantly higher travel distance to take part in the PA in 2016 compared to 2014. The sex distribution was not different between 2014 and 2016 (Figure 3). Women were overrepresented in oncology and underrepresented in cardiology.

In general, the participants of the different groups were mainly sedentary before the diagnosis of their disease, especially in cardiology and in obesity and overweight (Figure 4). Overall, no difference was observed here between 2016 and 2014. However, more participants were sedentary before diagnosis of cancer in 2016 than in 2014 ($\chi2 = 4.09$, $P = 0.043$). More participants in orthopaedics were active before their pathology in 2016 than in 2014 ($\chi2 = 8.92$, $P = 0.003$). In 2016, more than 66 % of the participants were doing additional PA (Figure 5). This percentage remained stable compared to 2014. However, the percentage decreased significantly in 2016 for the obesity and overweight group ($\chi2 = 12.87$, $P < 0.001$).

The type of recruitment is presented in Figure 6. Participants were mainly recruited by the healthcare professionals, especially in orthopaedics, cardiology as well as in obesity and overweight. Overall, the type of recruitment has not changed between 2014 and 2016. However, the participants in orthopaedics were referred less often by their family and friends in 2016 than in 2014 ($\chi2 = 10.00$, $P = 0.002$). Media and/or associations did not lead to recruit any participant in the obesity and overweight groups in 2016 ($\chi2 = 8.68$, $P = 0.003$). However, even if media and associations were the predominant type of recruitment in neurologic or rare diseases group, it led to recruit less participants in 2016 than in 2014 ($\chi2 = 4.52$, $P = 0.002$).

Finally, 69 % of the participants would appreciate to receive a medical prescription for PA. The percentage was 83 % in orthopaedics, 67 % in obesity and overweight, 55 % in neurology and rare diseases, 64 % in oncology and 77 % in cardiology. In addition, 52 % of the participants would welcome a refund of the participation fees by their health insurance. The percentage was 70 % in orthopaedics, 73 % in obesity and overweight, 62 % in neurology and rare diseases, 55 % in oncology and 31 % in cardiology.

Discussion

Our study aimed to re-evaluate the different groups offering PA for people with non-communicable diseases in Luxembourg one year after the launch of the Sport-Santé project. Between 2014 and 2016, more than 11 hours per week of new PA have been created by the different organizations in orthopaedics, obesity and overweight, neurology and rare diseases, as well as in oncology. In total, more than 55 hours per week of PA are available for patients with NCDs. The Sport-Santé project may have partly contributed to the creation of these new activities.

One of the aims of Sport-Santé was to help the different organizations to increase the number of participants. The absolute participation may have increased as the number of hours per week of PA also has increased. Nevertheless, the participation rate, which should be doubled [17], did not change between 2014 and 2016. Since the launch of Sport-Santé and its website, several communications were realized to promote the project and the different groups. In fact, 13 articles have been published in local specialized journals that were distributed in hospitals [18], pharmacies [19], associated federations of the Luxembourgish Olympic committee [20], medical doctors [21], and within the different organizations which offer the PA [22-24]. These articles explained the positive effects of PA in the management of NCDs. Some of them only focused on a specific disease and included testimonials of active patients (e.g. cancer, Parkinson's disease, cardiovascular diseases [22-24]). In addition, Sport-Santé was presented at ten different events across the country with a booth in order to promote the different organizations which offer PA in people with NCDs. Finally, Sport-Santé was introduced to the physiotherapy units of the Luxembourgish hospitals. This communication strategy, which is necessary to increase the awareness of Sport-Santé, could be upgraded and developed to better reach the medical doctors and the general population.

Participants were younger in 2016 than in 2014, especially in Orthopaedics. This result can be explained by the creation of the 1st Return-to-Sports Group Luxembourg which is mainly composed by young injured adults aiming to return to play. In contrast, participants with neurologic and rare diseases were older in 2016. The results may also suggest that there is a larger turnover in the orthopaedic group compared to the neurologic and rare disease group. The time since enrolment was shorter in 2016 than in 2014. On one hand this difference may be due to the enrolment of new people with a recent disease and, on the other hand, it could be the result of a high number of withdrawals among long-term participants. It could also be the result of the youth of the 1st Return-to-Sports Group Luxembourg which has been launched recently. Patients who were the least active before their diagnosis were those from the

cardiology and the obesity and overweight groups. Physical inactivity is known as a strong risk factor for these conditions [6, 25, 26]. Therefore, healthcare professionals (medical doctors, physiotherapists, nurses, etc.) should encourage their patients to engage in a long-term PA program. However, different studies indicate that the majority of patients does not increase PA after the diagnosis of NCDs [27, 28]. The type of recruitment did not change between 2014 and 2016. PA was recommended by healthcare professionals (i.e. medical doctors and allied health professionals) for more than 57 % of the participants. This percentage increased to 85 % in the obesity and overweight category. The increase in the numbers of healthcare professionals counselling their patients to be more active must be targeted. Healthcare professionals must promote more PA as it protects the health of their patients and the general population [29]. Moreover, they have a responsibility since patients are inclined to follow their recommendations. Therefore, healthcare professionals are one of the most reliable ways to promote PA in patients with NCDs. The PA status of the patient should be evaluated at every consultation and, if necessary, additional advise provided. A failed inclusion of the promotion of PA during a consultation is even considered by some as a medical neglect [30]. However, medical doctors often hesitate to prescribe PA for different reasons: lack of reimbursement, own exercise habits, lack of time, overestimation of the adverse effects of the PA, fear of litigation and limited knowledge [31]. In our study, more than 69 % of the participants believed that a medical prescription would be suitable for the participation in the PA. More than half of the participants would appreciate a refund of the participation fees, the lowest percentage being observed in the cardiology group which is supported by the Ministry of Health. The prescription could be an appropriate tool to help raising the number of participants. However, PA is not yet recognized as a treatment option in Luxembourg and is not reimbursed by the Luxembourgish National Health Fund. In Luxembourg, as in many other countries [32], PA is therefore underprescribed.

In Luxembourg, some efforts are currently made (e.g. the national action plan "Gesond iessen – méi bewegen") but do not specifically target individuals with NCDs. However, the government bodies should engage more actively in the promotion of PA by providing health-related information to health professionals and whole communities. Efficient use of advocacy and communication to convince more people of the positive effects of PA on health, especially in people with NCDs, is required. Advocacy, defined as "the combination of individual and social actions designed to gain political commitment, policy support, social acceptance and systems support, for a particular health goal or program" [34] is currently growing in Luxembourg. This is illustrated through initiatives such as the Sport-Santé project, different organizations offering PA for people with NCDs, the recently created Fédération Luxembourgeoise des Associations de Sport de Santé, membership of the Luxembourg Institute of

Health at the HEPA Europe network, etc. [35]. Indeed, the communication of the associations (press, internet, radio, TV, booths, etc.) was, in our study, the main type of recruitment in oncology and rare diseases. However, other partners (e.g. community workers, health professionals, non-health sector, non-government sectors, academics and general community) should join the advocacy to encourage policymakers to invest in order to decrease the sedentary behaviours, especially in people with NCDs [33]. In addition, the communication strategy should target professionals and general community to promote the different actions to increase PA. Other approaches, such as exercise-referral schemes or financial-incentive schemes, could be implemented to raise the number of participants [36]. All sustainable strategies (e.g. training for healthcare professionals) tackling problem in many ways are necessary [37]. Finally, interventions aiming to increase PA participation have been demonstrated to be cost-effective for society [38, 39]. Indeed, brief advices delivered by healthcare professionals increase PA in adults at a reasonable cost [39]. This strong argument must help the policymakers to enhance the promotion of PA, which is moreover recommended by the Regional Office for Europe of the World Health Organization [40].

In conclusion, the offer of PA for people with NCDs is increasing in Luxembourg. However, the current efforts must be sustained by all the stakeholders. In addition, advocacy and governmental communication must be developed to increase the participation rate and to decrease the sedentary behaviours. The prescription of PA must be raised at a national level.

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Ré-irradation stereotaxique des gliomes malins de haut grade

Résultats préliminaires

d'une cohorte de patients traités au Luxembourg

Vers un nouveau paradigme du suivi post-thérapeutique

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Abstract

Purpose of the study :

To evaluate the efficacy of fractionated stereotactic reirradiation with CyberKnife (CK) performed in 6 patients with high grade gliomas treated in Luxembourg with local recurrence (LR).

Patients and Methods :

Between 04.2014 and 06.2016, 6 patients with multiform grade IV gliomas LR were reirradiated with CK (protocol CNER re-RT CFB1), as reirradiation. The mean time between primary radiotherapy and local recurrence (LR) is 14.1 months [4 - 38]. CK is performed with a dose of 36 Gy in 6 fractions (5 cases) and 30 Gy in 3 fractions (1 case)

Results :

LR after CK (progression free survival) is 3.4 months [2 - 7] (5 cases assessment). Mean survival after CK is 12 months [3 - 22] (3 cases assessment). Mean survival after initial diagnosis is 37 months [17 - 58] (3 cases assessment). No toxicity is noticed (4 cases assessment). Time to first progression after primary treatment is a strong predictor for survival.

Conclusion :

Fractionated stereotactic reirradiation with CK is well tolerated and effective (survival) in patients with LR high grade gliomas. In accordance with these results, the CFB Conseil Scientifique recommends a new paradigm for MRI follow-up high grade gliomas. After first line treatment, **an MRI has to be performed every 3 months**, to identify LR earlier, and to offer the patients a way of salvage with CK option, in order to increase his chances of better survival.

Résumé

Objectif de l'étude :

Evaluer l'efficacité de la ré-irradiation stéréotaxique fractionnée par CyberKnife (CK), réalisée chez 6 patients porteurs de récidives locales (RL) de gliomes de haut grade traités au Luxembourg.

Patients et méthodes :

Entre 04.2014 et 06.2016, 6 patients porteurs de RL de glioblastomes multiformes de grade IV ont bénéficié d'une ré-irradiation par CK, (protocole CNER re-RT CFB1). Le temps moyen entre le traitement primaire et la RL est de 14.1 mois [4 - 38]. La dose délivrée par CK est de 36 Gy en 6 fractions (5 cas) et 30 Gy en 3 fractions (1 cas).

Résultats :

La RL après CK (survie sans récidive) est survenue dans un délai moyen de 3.4 mois [2 - 7] (5 cas évaluables). La survie moyenne après CK est de 12 mois [3 - 22] (3 cas évaluables). La survie moyenne après le diagnostic initial est de 37 mois [17 - 58] (3 cas évaluables). Aucune toxicité n'est observée (4 cas évaluables). Le temps jusqu'à progression après le traitement primaire est un puissant critère prédictif de survie.

Conclusion :

La ré-irradiation stéréotaxique fractionnée par CK est bien tolérée et efficace (en survie) chez les patients porteurs de RL de gliomes de haut grade. Sur ces bases, le Conseil Scientifique du CFB recommande un nouveau paradigme de suivi par IRM des patients porteurs de gliomes de haut grade. **Après le traitement de première ligne, une IRM doit être réalisée tous les 3 mois,** pour identifier précocement les RL, et offrir aux patients une option de rattrapage par CK, dans l'objectif d'améliorer les chances de meilleure survie.

Mots clés

Glioblastome, récidive locale, ré-irradiation, CyberKnife, survie

Introduction

Les gliomes malins de haut grade (gliomes anaplasiques : astrocytome anaplasique, oligodendrogliome anaplasique et oligoastrocytome anaplasique et glioblastomes grade IV) sont des tumeurs cérébrales caractérisées par leur risque très élevé et leur rapide cinétique de progression. L'approche thérapeutique est fondée sur des modalités combinées associant l'exérèse chirurgicale (macroscopiquement complète quand elle est réalisable) suivie d'une radiothérapie-chimiothérapie concomitante (ARC) postopératoire puis d'une chimiothérapie adjuvante. Ce schéma classique (60 Gy et Temozolomide concomitant et adjuvant) est appliquée au Luxembourg (1) (6) (7) (recommandation grade 1A). Les résultats de ce schéma thérapeutique se caractérisent par une survie médiane de 14.6 mois, et une survie à deux ans de 26.5 %.

Au moment de la récidive tumorale, les options thérapeutiques sont limitées. La reprise chirurgicale est rarement possible, la chimiorésistance et le risque de toxicité limitent l'efficacité de la chimiothérapie de rattrapage. La radiothérapie stéréotaxique fractionnée est une option nouvelle, en cours d'investigation (NCCN guideline) (7). Nous présentons une étude de cohorte de patients porteurs de récidive locale (RL) de gliomes malins de haut grade, traités par ré-irradiation stéréotaxique robotisée par CyberKnife (CK), dans le cadre d'une étude observationnelle prospective.

1. Moyens et méthodes

1.1. Patients et méthodes

Le Comité National d'Éthique et de Recherche du Luxembourg a donné un avis positif (N°201311/01) à la réalisation de l'étude prospective (CYM6 re-RT CFB1) portant sur les ré-irradiations. L'objectif principal de l'étude est la survie moyenne après la ré-irradiation stéréotaxique de la RL. Les objectifs secondaires sont la survie moyenne après le diagnostic initial et la toxicité de la ré-irradiation stéréotaxique.

1.2. Modalités thérapeutiques de ré-irradiation stéréotaxique par CyberKnife

Une fusion des images IRM (tumeur contourée par le neuroradiologue) et des images scanner de simulation est réalisée. Le volume tumoral (GTV) est validé en réunion de concertation neurochirurgiens/radiothérapeutes, il est défini comme le volume de rehaussement du gadolinium en séquence T1. Le volume clinique traité (CTV) est équivalent au volume tumoral de récidive IRM (sans inclure l'oedème) avec une marge de 0 à 4 mm, adapté au volume de la RL et à sa

topographie. La tumeur est traitée par une isodose de 79 à 83 %. La ré-irradiation stéréotaxique est délivrée en 6 fractions de 6 Gy, trois fois par semaine, soit une dose totale de 36 Gy.

Tableau 1 : modalités de réalisation du 1er CK

Volume de la tumeur de RL (cc) Moyenne Étendue Lésions multiples	 10.8 cc [1.5 à 31.4 cc] 1 cas
Isodose de traitement Moyenne Étendue	 80 % [79 à 83 %]
Protraction 36 Gy en 6 fractions (3 par semaine) 30 Gy en 3 fractions (3 par semaine)	 5 cas 1 cas
Toxicité aiguë et tardive Corticothérapie en cours de CK	0 cas 6 cas

RL : récidive locale ; CK : CyberKnife

2. Résultats

2.1. Patients de la cohorte

Entre janvier 2014 et juin 2016, 63 patients porteurs de gliomes de haut grade (glioblastomes multiformes) ont été pris en charge au Centre François Baclesse et ont bénéficié d'une ARC par radiothérapie conformationnelle postopératoire, par une dose de 60 Gy en 30 fractions quotidiennes de 2 Gy, avec Temozolomide concomitant à la radiothérapie puis Temozolomide adjuvant. Au cours de la même période de 30 mois, 6 patients porteurs de RL de glioblastome ont bénéficié d'une ré-irradiation par radiothérapie stéréotaxique robotisée par CK, soit 8% des patients traités.

2.2. Toxicité

Aucune toxicité aiguë n'a été identifiée (4 cas évaluables). Tous les patients ont reçu une corticothérapie pendant toute la durée du traitement par CK. Un cas de radionécrose non symptomatique (associée à du tissu tumoral résiduel), prouvée lors de la reprise neurochirurgicale, est survenu 5 mois après la ré-irradiation. L'évolution de ce cas se caractérise par une nouvelle progression locale 11 mois après la reprise chirurgicale, puis une deuxième séquence de radiothérapie stéréotaxique 21 mois après le premier CK.

Tableau 2 : caractéristiques patients/traitements avant CK

Glioblastome multiforme	6 cas
Age au diagnostic Médian Étendue	 54.2 ans [44-62]
Chirurgie initiale Résection macroscopiquement complète Résection subtotale Biopsie exclusive	 3 cas 1 cas 2 cas
Dose initiale de RT	60 Gy
Chimiothérapie concomitante à la RT (ARC) (Temozolomide quotidien)	6 cas
Chimiothérapie adjuvante lors du traitement initial (après ARC) (Temozolomide 5 j/tous les 21 j)	6 cas
Délai RL après ARC Médian Étendue	 14.1 mois [4-38]
Chirurgie rattrapage après ARC et avant CK (sub-totale)	1 cas

RT : radiothérapie ; ARC : association radiothérapie concomitante ; RL : récidive locale.

Tableau 3 : caractéristiques patients/traitements après CK

Deuxième ré-irradiation CK 11 mois après 1° CK Deuxième ré-irradiation CK 26 mois après 1° CK	1 cas 1 cas
Chimiothérapie palliative après CK (pour progression)	4 cas

Tableau 4 : réponse à la ré-irradiation CK

Délai de récidive après CK (mois) (5 cas évaluables) Moyenne Écart	 3.4 mois [2-7 mois]
Survie après CK (mois) (3 cas évaluables) Moyenne Écart	 12 mois [3-21 mois]
Survie après le diagnostic initial (mois) (3 cas évaluables) Moyenne Écart	 37 mois [17-58 mois]
Survie après le diagnostic initial (mois) selon délai RL (3 cas évaluables) - RL avant 6 mois suivant ARC - RL après 6 mois suivant ARC	 17 mois 36 et 58 mois
Status au moment de l'analyse (08.2015) Patients décédés Patient en follow-up précoce (<3 mois) Patient en follow-up tardif, progression (40 mois)	 3 cas 2 cas 1 cas

2.3. Evolution après CK : récidive et survie

Lors de l'analyse (08.2016), 3 patients sont décédés et 3 sont en follow-up, dont un patient en progression locale après 2 séquences de stéréotaxie (avec une survie de 40 mois après le diagnostic initial).

Le délai moyen entre la fin du traitement initial (ARC) et la RL est de 14.1 mois [4 à 38 mois] (pour les 6 cas traités). La survie moyenne après le diagnostic initial est de 37 mois [17 à 58 mois] (3 cas évaluables en survie). Le délai de nouvelle récidive RL après CK est de 3.4 mois [2 à 7 mois] (5 cas évaluables). La survie moyenne après la ré-irradiation CK est de 12 mois [3 à 21 mois] (3 cas évaluables).

La survie est corrélée au délai de survenue de la RL après le traitement initial (ARC). Pour le cas de RL précoce avant 6 mois (4 mois), la survie après le diagnostic initial est de 17 mois. Pour les 2 cas de RL tardive après 6 mois (7 et 9 mois), la survie après le diagnostic initial est de 36 et 58 mois.

Deux patients ont bénéficié d'une deuxième ré-irradiation CK. Avec une survie de 58 mois pour un cas et une survie après le diagnostic de 40 mois (patient actuellement en vie, avec progression locale).

Les facteurs qui influencent favorablement la survie après la ré-irradiation stéréotaxique par CK sont le faible volume de la récidive tumorale et le long intervalle entre la fin du traitement initial et la RL. La chirurgie de rattrapage avant le CK (1 cas) versus le CK d'emblée, n'améliore pas la survie après le diagnostic initial (17 mois pour le cas opéré avant CK versus 36 et 58 mois pour les 2 cas avec CK d'emblée).

Les 4 patients en progression locale confirmée ont été placés sous Bevacizumab.

3. Discussion

En 2016, il n'existe pas de standard pour le traitement de rattrapage des RL faisant suite à un traitement initial par ARC et chimiothérapie adjuvante des gliomes de haut grade (6) (7).

La chimiothérapie palliative se caractérise par une survie médiane de l'ordre de 7.5 mois (3) et dans les meilleures études rétrospectives le Bevacizumab prolonge la survie moyenne.

Des études rétrospectives ont démontré que la ré-irradiation stéréotaxique fractionnée est réalisable pour traiter la RL avec une dose totale de 36 Gy (5) (2). Il n'existe aucune étude randomisée pour préciser la place de la chimiothérapie concomitante à la ré-irradiation.

La radiothérapie stéréotaxique fractionnée robotisée est un traitement réalisé en ambulatoire, respectueux de la qualité de vie et peu coûteux (par rapport aux traitements systémiques).

Dans notre expérience (4 cas évaluables en toxicité), un cas de suspicion de nécrose a justifié une ré-intervention 5 mois après le CK, confirmant la présence de tissu nécrotique associé à un tissu tumoral actif.

Le délai de récidive comme facteur de survie après la ré-irradiation n'est pas retrouvé dans toutes les études rétrospectives. Dans notre expérience, le cas avec RL précoce (avant 6 mois) a une survie après le diagnostic initial de 17 mois, alors que les 2 cas avec RL tardive (après 6 mois) ont des longues survies après le diagnostic initial de 36 et 58 mois.

La revue de la littérature, essentiellement fondée sur deux études rétrospectives COMBS (2), (Heidelberg University, 2005, 49 cas) et FOGH (5), (Thomas Jefferson University, 2010, 147 cas), nous permet de confronter nos résultats préliminaires. La dose totale (36 Gy) et la protraction (6 fractions en 10 jours) du protocole CFB sont conformes aux études rétrospectives de référence. La discussion porte sur la marge définissant le volume de RL irradié (CTV). Les trois premiers cas traités au CFB avaient une marge nulle (GTV = CTV), alors que les études rétrospectives (5) (2), ont retenu des marges de 5 à 10 mm. Notre staff a décidé, en l'absence de toxicité identifiée (avec un suivi moyen de 19.6 mois pour 4 cas évaluables) d'étendre les marges de 2 à 4 mm (selon le volume et la topographie de la RL) pour les trois cas suivants.

Dans notre cohorte nous observons la survenue des RL après CK dans un délai moyen de 3.4 mois [2-7 mois] (4 cas évaluables). Ce délai court jusqu'à nouvelle progression locale est cependant compatible avec une survie prolongée. En effet, la survie moyenne après CK (3 cas évaluables en survie) est de 12 mois, ce qui est conforme aux 11 mois de la survie de la série de FOGH (5) et aux 5 mois de la survie de la série de COMBS (2). La survie moyenne après le diagnostic initial (3 cas évaluables en survie) est de 37 mois, ce qui est conforme aux 24 mois de la survie de la série de FOGH (5) et 21 mois de la survie de la série de COMBS (2).

Conclusion

Les résultats préliminaires de la cohorte de patients traités par ré-irradiation stéréotaxique robotisée par CK pour RL des glioblastomes, (6 cas de RL dont 3 évaluables en survie et 4 en toxicité à la date de publication) sont caractérisés par une bonne survie (par rapport aux données de la littérature) et une toxicité nulle (sauf 1 cas de radionécrose non symptomatique).

L'étude CYM6 Re RT CFB1 appliquée aux RL de gliomes de haut grade, constitue une offre de soins innovante au Luxembourg. Le traitement de rattrapage n'a cependant concerné que 8 % des gliomes traités par le protocole standard

pendant la période de l'étude (04/2014 – 06/2016). Devant l'histoire naturelle des gliomes de haut grade, caractérisée par leur constante RL (dans un délai moyen de 14 mois après le traitement initial), une nouvelle opportunité de traitement de deuxième ligne par radiothérapie stéréotaxique robotisée par CK doit conduire à une revue des standards de surveillance IRM des patients traités.

Un nouveau paradigme de surveillance thérapeutique s'impose aujourd'hui : afin de diagnostiquer la RL le plus précocement possible (effet du délai de la RL et effet du volume à ré-irradier), la recommandation formule par le Conseil Scientifique du CFB est de réaliser une IRM de surveillance tous les 3 mois, à partir de la fin de la séquence du traitement initial de référence appliqué à la tumeur (ARC).

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Recommendations for the neuropsychological assessment supporting the diagnosis of dementia in the Luxembourgish context (NP-DiaDem)

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On behalf of the Taskforce Neuropsychologie Démence of the Luxembourg Society of Psychology (SLP)

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Abstract

The diagnosis of neurocognitive disorders such as mild cognitive impairments and dementia is a challenging endeavour. On behalf of the neuropsychologists of the Luxembourgish Society of Psychology (SLP), the authors develop a common framework for the neuropsychological diagnosis of dementia in the Luxembourgish context (NP-DiaDem) and promote the role of the neuropsychologist in this process. The paper's aim is threefold: (I) highlighting the role of the neuropsychological evaluation to support the medical diagnosis of neurodegenerative cognitive disorders; (II) providing recommendations for the neuropsychological assessment, based on recently published international guidelines; and (III) providing a new diagnostic process, facilitating the differentiation between mild and more severe states of cognitive decline. An important heterogeneity in the evaluation of cognitive performances and assessments instruments exists, partly due to the multicultural and multilingual context of the population living in Luxembourg. Prior applying the present recommendations, a note on the specific Luxembourgish context is provided as it influences directly the diagnostic process. The absence of validated and culturally adapted assessment tools for the Luxembourgish context is a serious problem in the diagnosis of cognitive deficits of either origin. The taskforce therefore strongly recommends and supports the development of a large database of cognitive performance data and hence population-specific norms for some of the most basic diagnostic tools.

Keywords:

neuropsychology, neuropsychological assessment, dementia, mild cognitive impairment mci, neurocognitive disorders, early diagnosis, recommendations

Introduction

According to the most recent World Alzheimer Report, the number of people living with dementia will nearly double every 20 years, to reach 75 million worldwide in 2030 and over 131 million by 2050 (Alzheimer Disease International, 2015). This important increase of neurocognitive disorders and dementia has a global impact on primary and long-term care models and challenges also social security systems around the world. Over a decade ago, economic models deduced from the Kungsholmen project (Wimo & Winblad, 2003) suggested that a decrease of 1 point on a measure of overall cognition, the Mini-Mental State Examination (MMSE) score (Folstein, Folstein, & McHugh, 1975), is associated to an increase in costs of approximately 1800€. Delaying the transition from mild cognitive impairment (MCI — minor cognitive deterioration without daily living implication with MMSE scores between 24-30) to dementia (major cognitivedeterioration with impairments in activities of daily living and MMSE scores between 18-23) was estimated to reduce annual costs by approximately 5700€ per patient (Wimo & Winblad, 2003). Although research has not yet identified a cure, early diagnosis is of great importance to reduce the impact of dementia and figures as a prerequisite for cost-effective care (Winblad et al., 2016). Early and tailored interventions like physical and mobility training programs, social activities and cognitive training are promising in prolonging the autonomy and well being of the person (Ball et al., 2002; Montero-Odasso et al., 2015; Rebok et al., 2014). In addition, and importantly, patient and family education from early on may reduce family burden and prevent negative outcomes for the patient (e.g. comorbidities) and for the caregiver (Gilhooly et al., 2016; Health Quality Ontario, 2008; Li, Cooper, Bradley, Shulman, & Livingston, 2012). The diagnosis of dementia at a very early stage has become a prominent field of research and scientific consideration. Generally, cognitive decline and psychological disturbances are the major complaints of people with early dementia. The reliable detection of subtle neuropathological signs of the disease challenges researchers and clinicians, resulting in the publication of exhaustive guidelines to diagnose and to differentiate between different types of dementia (Albert et al., 2011; McKhann et al., 2011). In addition to a medical (neurological) evaluation of the patient using imaging, blood tests, and physical examinations, a sound neuropsychological evaluation of the aforementioned criteria based on standardized assessment methods should be the core feature of every diagnostic process.

To this already challenging endeavour of diagnosing dementia, we must take into account the complexity of a very heterogeneous Luxembourgish socio-cultural and multilingual population background. This variety is not only present in the patient population. Diverse academic and scientific backgrounds among clinicians lead to a great diversity of cognitive assessments currently in use. Until now, there is no consensus among neuropsychologists working in Luxembourg what cognitive assessments to use to support the diagnosis of dementia. To reduce this heterogeneity among the neuropsychological assessment of cognitive deficits performed by psychologists practicing in Luxembourg, the present taskforce agreed on a common framework for the diagnosis of dementia in the Luxembourgish context. The taskforce's goal was not to develop new guidelines. We aimed at (I) highlighting the role of the neuropsychological evaluation to support the medical diagnosis of neurodegenerative cognitive disorders, (II) presenting the core criteria for neuropsychological assessment based on an overview of the international guidelines of dementia, and (III) providing a new framework of neuropsychological assessment to differentiate between mild and severe states of cognitive decline.

I. The neuropsychological evaluation supports the medical diagnosis of neurodegenerative disorders

A neuropsychological evaluation is performed to objectify cognitive declines and to validate subjective complaints expressed by a person or the family. Importantly, the use of standardized assessment instruments is a necessary condition to validate the presence of cognitive deficits and as such, to support the medical diagnosis of neurocognitive disorders of either aetiology. A first approach can consist of so-called screening tests to gain a quick and broad overview of diverse cognitive functions in a relatively short amount of time. One of the most commonly used screening tests for neurocognitive disorders used in a medical context is the MMSE. The MMSE is easy and quick to apply and exists in different languages. The correct interpretation of MMSE scores is however challenging in the clinical context, as it needs taking into consideration the appropriate age- and education-adjusted norms (Lezak, Howieson, Bigler, & Tranel, 2012). More specifically, ceiling effects and poor sensitivities make the detection of mild cognitive impairments in highly educated individuals difficult (Amieva et al., 2005). It is furthermore known that age and other factors such as psychological comorbidities may influence the results (Bierman, Comijs, Jonker, & Beekman, 2005). The thorough evaluation of cognitive deficits requires a (neuro-)psychologist. A qualified neuropsychological evaluation is defined (a) by using appropriate, objective and well standardized testing instruments; (b) by interpreting the test results in the context of all other potentially intervening factors (e.g., affectivity, social factors, comorbidities, professional background, educational attainment level) ; and (c) in providing clinically sound and coherent recommendations for further diagnostic and/or therapeutic care. Thus, the neuropsychological assessment is complementary to the other exams (e.g., imaging, blood tests, biomarkers) prescribed by medical doctors and is supportive to the medical diagnosis of neurodegenerative cognitive disorders.

II. Core criteria of the neuropsychological assessment

The present recommendations are those considered important for the neuropsychological evaluation of the patient and are based on the diagnostic criteria published by the National Institute on AgingAlzheimer's Association (NIA-AA, Albert et al., 2011; McKhann et al., 2011) and the most recent version of the Diagnostic and Statistical Manual of Mental Disorders (DSM-V, American Psychiatric Association, 2013). Further, published consensus papers from Switzerland (Monsch et al., 2012), Germany (DGPPN, DGN, Deutsche Alzheimer Gesellschaft e.V., 2015) and France (Croisile et al., 2012) were also considered. From these publications, we extracted the current core diagnostic criteria. For a more detailed description of these diagnostic criteria, the reader is referred to the respective publications. The following core diagnostic criteria are assessed during neuropsychological evaluations:

- Concern of cognitive decline emanating from the patient and/or a knowledgeable other
- Impairment in at least one cognitive domain (moderate or severe)
- Interference with or independent in activities of daily living
- Deficits are not better explained by other mental health issues

For quantitative evaluations, international guidelines refer to the following cut-off scores. Generally, a test score of 3 percentile points or lower, or a z-score lower than −2 are indicative of major neurocognitive disorders (American Psychiatric Association, 2013). Percentile scores between 3 and 16, or z-scores between −1 and −2 are indicative of mild cognitive impairment (mild neurocognitive disorder) (American Psychiatric Association, 2013). Importantly, age- and education-adjusted norms are paramount in the diagnostic process. Those norms and reference scores are available for a number of diagnostic tools. Caution when applying those norms as cut-off scores is advisable because there are currently no cut-off values available for the Luxembourgish context (see discussion section). Therefore, the taskforce recommends considering the published norms as reference scores and not as cut-off scores. As a disorder may either go (a) undiagnosed in individuals with high socioeconomic status (Garibotto et al., 2008); or (b) may erroneously be diagnosed, with poor test results being the consequence of external factors like test conditions, fatigue, or pharmacological influences, clinical reasoning remains in any case necessary and is explicitly recommended by the taskforce. It should be noted that it is under the neuropsychologist's responsibility to choose the most adequate and scientifically valid assessment tool to evaluate each of these symptoms. For quantitative measures, special care should be given to the norms of each test and attention

should be paid to potentially intervening factors such as language, age, educational attainment levels, and socioeconomic status of the patient. The reader should note that norms, cut-off scores, and any other intervening factor may directly influence the outcome of the evaluation process.

III. Neuropsychological assessment of neurocognitive deterioration – Framework to differentiate between mild states of cognitive decline (e.g., mild cognitive impairment, MCI) and more severe deteriorations of cognitive function (e.g., dementia)

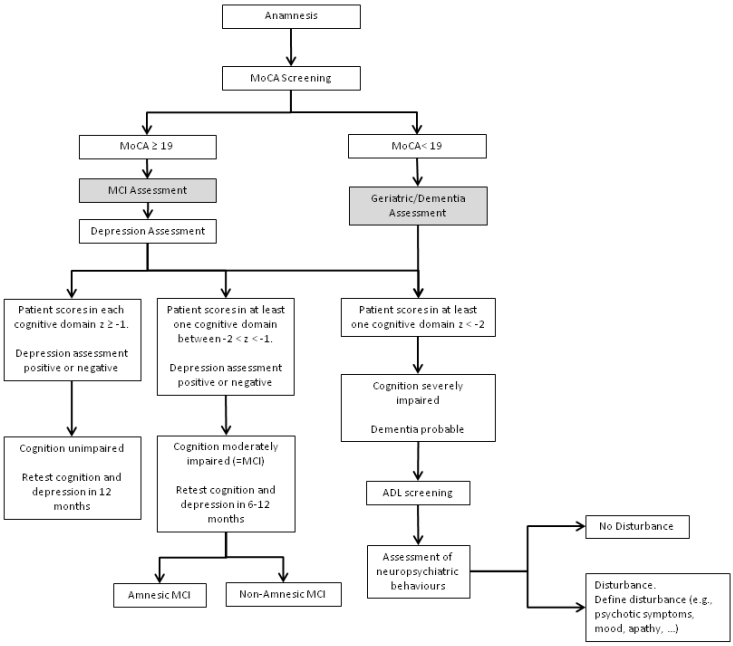
Given the core diagnostic criteria and the limitations associated with cut-off scores mentioned above, the following framework proposes a diagnostic process facilitating neuropsychological assessment in neurocognitive disorders and enables differentiating efficiently between mild and major cognitive disorders. The taskforce defines two types of assessments, namely an MCI assessment and a geriatric/dementia assessment. After an initial but extensive anamnesis, a screening phase serves as a gatekeeper to decide which type of assessment is applied (see figure 1). The final step of the diagnostic process is the outcome, with the written report and the follow-up recommendations. In the clinical context, constraints in resources (i.e., time, financial) may be important and have to be taken into consideration. The purpose of the proposed decisional flowchart is thus to consider these constraints by guiding the clinician trough the clinical evaluation of the patient.

Diagnostic process

The taskforce considers the focus of the neuropsychological evaluation to be the detection of very early signs of neurocognitive disorders (i.e., MCI); and thus, to inform about the degree of degradation. With figure 1, a decisional flowchart guiding the assessment by the neuropsychological clinician is provided.

Anamnesis

Each diagnostic process starts with a thorough interview, or anamnesis. During the anamnesis, concerns of the patient and their acquaintances (e.g., family members) should be paid outmost consideration. Both of these assessments (self-report and proxy-report) are preferably performed using a quantified evaluation.



A qualitative approach is also appropriate. In this case, however, considerable clinical experience is desirable in the psychologist; he/she should have in-depth knowledge of the required diagnostic criteria. With either approach (quantitative or qualitative), some basic information from the patient needs to be collected during the neuropsychological anamnesis (table 1).

Table 1. Information to be collected during the anamnesis using a quantitative or qualitative approach

Domain	Criteria
Subjective cognitive decline	Mild - Moderate - Severe
Onset and progression of cognitive decline	rapid onset, onset linked to medical condition, gradual in progression, fluctuations, extended plateaus
Behavioural abnormalities	Presence of behavioural disturbances
Activities of daily living	Difficulties in everyday activities
Depression	Presence or absence of a depressive symptoms or dysthymia, changes in interests
Socio-economic status, Educational attainment level	More or less than 12 years of education (compensate with professional background)

Montreal Cognitive Assessment (MoCA Screening)

The taskforce recommends the Montreal Cognitive Assessment scale (MoCA) as a first gatekeeper that can be used to trigger further, more detailed assessments. The MoCA presents a number of advantages. First, it is less probable that the patient has already been tested by the MoCA as the Mini Mental State Examination (MMSE) is currently the most widely used screening tool in the medical context (Trzepacz et al., 2015). Furthermore, the MoCA is a validated tool in a great number of different languages, an important advantage given the diverse Luxembourgish multicultural population. In addition, given the important number of parallel test versions available for the MoCA, using this test reduces the likelihood of having to deal with learning effects by the patient. Finally, the MoCA tool has well established validity and sensitivities, with published cut-off values. In a recent study, authors find that the MoCA cut-off for discriminating reliably a pathological sample with dementia from a sample composed of healthy controls was 23 (with a sensitivity of 94% and a specificity of 96%; Roalf et al., 2013). A MoCA score of 19 was found to discriminate reliably between patients with MCI and patients with Alzheimer's disease, with corresponding sensitivities ranging from 77% (Roalf et al., 2013) to 87% (Trzepacz et al., 2015) and specificities ranging from 77% (Trzepacz et al., 2015) to 80% (Roalf et al., 2013). The cut-off value in the MoCA of 19 points is considered a reliable and safe indicator of the presence or absence of a neurocognitive disorder. As such, two types of assessments are recommended based on the MoCa score.

Assessment

The taskforce recommends a geriatric/dementia assessment for patients with MoCA scores of 18 and below (see figure 1 and table 2). A score below 19 usually goes along with major cognitive drawbacks; the necessity of detailed and thorough cognitive assessments is in this case challenged. The neuropsychologist's role should be focused on the identification of neuropsychiatric deficiencies along with the global repercussions on activities of daily living (e.g., ADLs). In addition, special attention should be given to potential family burdens.

In patients demonstrating a MoCA score ≥19, an MCI assessment is strongly recommended (see figure 1 and table 3). This more thorough and detailed neuropsychological assessment aims at determining the characteristics of the perceived cognitive decline and the potential influences of psychological factors, such as depression.

Guided by the medical reports, the anamnesis and the subscores of the MoCA, the neuropsychologist should follow clinical reasoning and carefully choose the tests sensitive to the cognitive functions underlying a hypothesised pathology.

Table 2. Geriatric/Dementia assessment from the neuropsychological point of view

Domain	Criteria
Cognition	Additional cognitive assessment should be limited to a strict minimum. Refer to table 3 for cognitive functions deemed necessary to examine. Clinical reasoning is strongly advised.
Activities of daily living	Feeding, clothing, toileting, etc.
Neuropsychiatric behaviours	Disinhibition, apathy, psychotic symptoms, mood, etc.
Family burden	Exhaustion, burn-out, depression, etc.

A non-exhaustive list of the most relevant cognitive functions in respect to a probable underlying pathology is illustrated in table 3 (adapted from the S3 dementia guidelines published by DGPPN, DGN, Deutsche Alzheimer Gesellschaft e.V., 2015).

Table 3. Mild cognitive impairment (MCI) assessment

	Cognitive functions	Probable associated pathology
Clinical reasoning is recommended in assessing the most relevant functions and in selecting the most appropriate tests, depending on the respective clinical situation	Delayed recall and forgetting, recognition errors, semantic verbal fluency (semantic), naming, cued recall	Alzheimer's disease
	Speed of processing, verbal fluency (semantic, phonological), working memory, cognitive flexibility, executive functions	Vascular dementia
	Cognitive flexibility, executive functions, motor behaviour	Frontotemporal dementia (behavioural variant)
	Verbal naming, word fluency (phonological word fluency), calculations, writing	Frontotemporal dementia (semantic dementia, progressive aphasia variant)
	Attention (Alertness), visual attention, naming objects	Lewy body dementia
	Free recall vs. delayed recall, executive functions	Parkinson dementia

Outcome

If the patient's performances (i.e., test results) are within the norms and correspond to none or minor cognitive impairments, a retest should be offered 6-12 months later. If on the MCI assessment, results are below z <–2, the geriatric/dementia assessment should be realized ad hoc, by exploring in more detail ADLs and behaviour.

The neuropsychological assessment yields to (a) a written report, and (b) an oral feedback to the patient. In this feedback session, the results should be explained to the patient, and/or to his important others (if desired). Once the medical diagnostic is included, possibilities of diverse (psychological) treatments should be discussed (psychotherapy, psychoeducation, counseling, training, primary/secondary prevention, etc.). Individually tailored interventions, guidance and support as proposed by the neuropsychologist are likely to reduce caregiver burden and furthermore have beneficial quality of life effects on the patient (Gilhooly et al., 2016; Health Quality Ontario, 2008; Li et al., 2012).

Discussion

Clinicians and especially neuropsychologists working in Luxembourg are confronted every day with the challenge of accurately deciding between the clinical and diagnostic utility of an assessment tool and the drawbacks of imposing a tool to the patient that has neither been adapted from a cultural nor a lingual point of view to the Luxembourgish context. Consequently, clinicians are forced to evaluate their patients by using assessment tools in a foreign language (e.g., German, French) and to establish their diagnostic conclusions on norms taken from other countries (e.g., often Germany, France, Switzerland but also United Kingdom, USA or Canada). Luxembourg is characterized uniquely by its cultural, socio-economic, educational, and multi-lingual composition. The official languages are Luxembourgish, German and French and the multicultural context adds English, plus the native tongues of the immigrant population (mostly Portuguese and Italian). Studies conducted in the Luxembourgish context suggest a protective role of multilingualism on the development of cognitive deficits. The more languages the person speaks, the later the onset of cognitive decline (Perquin et al., 2013, 2015). This can probably be explained by the enhanced mental flexibility and greater executive functions needed in a multilingual context (Byalistock et al., 2012). In addition, it has been found that multilingualism contributes to a greater cognitive reserve (Stern, 2012). The language issue is however challenging in the context of dementia screening, especially when an early diagnosis is targeted. People tested in Luxembourg for neurocognitive disorders are evaluated in relation to normative

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samples that are not representative of the Luxembourgish context and hence differ from a lingual, cultural, socio-economic and educational background This practice is critical and must be improved by providing Luxembourgish norms for standard diagnostic tools in the context of neurodegenerative diseases. Especially in the identification of early or subtle changes in cognition, the presence of adequate norms is of paramount importance as they may inform the clinician on the presence (or absence) of an underlying pathological process. If these subtle changes in cognition are however masked by inadequate and non-adapted norms or diagnostic tools, the provision of early therapeutic measures will consequently be delayed until cognitive complaints become more obvious. The taskforce therefore recommends, and supports, the development of a large database of cognitive performance data and hence population-specific norms of some of the most basic diagnostic tools.

Conclusion

The primary goal of the present work is to facilitate the diagnosis of neurocognitive disorders in the context of neurodegenerative diseases in Luxembourg. The present paper thus presents recommendations on the neuropsychological assessment of cognitive disorders to support the diagnosis of dementia in the Luxembourgish context. In the perspective of an aging population and the growing number of people with dementia, the importance of an early diagnosis is of paramount importance. This paper emphasizes the importance of the neuropsychologist in this evaluation of early onset neurocognitive deficits. Reviewing the recent diagnostic guidelines, core deficits important in the neuropsychological evaluation are identified and highlighted. In addition, the taskforce proposes a framework to facilitate the neuropsychological diagnostic process. The outcome of this process aims at assisting the medical diagnosis and supporting the patient and his family. Th ese newly proposed recommendations will improve the interaction between intervening clinicians and will enhance care and support of the patient and their families.

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