Qualifications portfolio for teachers and researchers at Karolinska Institutet

Approved by the Board of Research, February 4th 2010

Since 1998 Karolinska Institutet (KI) has been using a special qualifications portfolio system to document the areas of competence for researchers and teachers. The aim of this system is to provide a basis for the evaluation of productivity and quality in terms of research, teaching, administration and clinical duties. The underlying philosophy is that all these activities are essential in the development of KI and should be evaluated in relation to the goals laid down for academic activities. The qualifications portfolio covers four different areas:

1. In the *ranking of applicants* for academic positions. Before each appointment is made, a job profile is prepared which includes an explanation of the reasons for the assessment and the weight that should be placed on the applicant's skills in the various areas covered by the qualifications portfolio. The qualifications portfolio is used when ranking applicants on the basis of the agreed job profile outlined in the advertisement.

2. In the *case of promotion*, for example from lecturer to professor. The information within the portfolio provides the basis for an evaluation by the Recruitment Committee of KI whether the applicant meets the requirements for promotion to a professor degree.

3. For *personal development appraisals* and for the *individual's acquisition of new skills*.

4. For *salary negotiations*.

The qualifications portfolio comprises five areas: Curriculum Vitae, scientific portfolio, pedagogical portfolio, clinical portfolio and leadership, development and workplace relations portfolio. For each of these latter four areas covered by the qualifications portfolio there is a written statement of goals and instructions on the way that qualifications are documented.

KAROLINSKA INSTITUTET
CURRICULUM VITAE

Name: Paolo Macchiarini
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Current Positions:

Time	Percentage Activity	Affiliation	Function	Location
Since 06/2011	15	European Thoracic Research Center	Director	Florence (I)
Since 03/2011	5	Advanced Center of Translational Regenerative Medicine, Karolinska Institutet	Director	Stockholm (SE)
Since 12/2010	40	Karolinska Institutet	Visiting Professor	Stockholm (SE)
Since 12/2010	20	Division of ENT, Karolinska University Hospital Huddinge	Överläkare	Stockholm (SE)
Since 01/2010	15	University Hospital Florence	Consultant, Thoracic Surgery	Florence (I)
Since 01/2010	5	University College London	Honorary Professor and Consultant	London (UK)

Previous Positions

Here you describe your previous position in reversed chronological order.

01/2005-12/2009 Department of General Thoracic Surgery Hospital Clinic, University of Barcelona, Barcelona (Spain)

04/ 1999-12/2004 Department of General Thoracic and Vascular Surgery, Heidehaus Hospital, Hannover Medical School, (Germany)

08/1995-03/1999 Department of Thoracic and Vascular Surgery and Heart-Lung Transplantation, Hôpital Marie-Lannelongue, Paris-Sud University, Le Plessis Robinson (France)

Education

Post-graduate:

2000	Specialization in Thoracic Surgery. Medical Council Lower Saxony, Hannover (Germany).
1997-1998	Habilitation as Research Director. Main Supervisor: Prof. Alain Charpentier. University: Paris-Sud University, Paris (France).
1994-1997	PhD In Life and Health Science. Title of Thesis: From tracheal and trachea-esophageal allotransplantation to lung xenotransplantation. Main Supervisor: Prof. Philippe Dartevelle. University: University of Franche-Côpmte, Beçanson (France)
1/1991-12/1993	Master of Science in Organ and Tissue Transplantation. Title of Thesis: Trachea and trachea-esophageal allotransplantation. Main Supervisor: Prof. Philippe Dartevelle. University: University of Franche-Côpmte, Beçanson (France)
1990-1991	Master in Biostatistics, University of Alabama at Birmingham, Birmingham (USA)
11/1986-12/1991	Specialization in General Surgery. Title of Thesis: Neoangiogenesis in non-small cell lung cancer. Main supervisor: Prof. Mario Selli. University: University of Pisa, Pisa (Italy)

Graduate:

1979-1986	MD. Title of Thesis: Surgical treatment of giant emphysema bullae. Main Supervisor: Prof. Carlo Alberto Angeletti. University: University of Pisa, Pisa (Italy)

Docentur

Since 11/2010	Lectures for medical students and clinical and research fellows instruction, Karolinska Institutet, Stockholm (Sweden)
Since 10/2010	Lectures in reconstructive surgery of the airway (4th year) and principles of regenerative medicine (5th year). Faculty of Medicine, University of Florence, Florence (Italy)
04/2008 –12/2010	EU master in respiratory medicine. Lectures in principles of airway surgery and surgical techniques in general thoracic surgery, and principles of regenerative medicine, University of Barcelona, Barcelona (Spain)

02/2007-12/2009	Master in organ transplantation. Lectures in lung and heart-lung transplantation and tissue engineered replacements of intrathoracic organs and complex tissues. University of Barcelona, Barcelona (Spain)
03/2005-12/2009	Director, Post-graduate program of general thoracic surgery, Hospital Clínic, University of Barcelona, Barcelona (Spain)
03/2005/12/2009	Master Intensive Care Unit. Lectures in thoracic trauma and extracorporeal lung support. University of Barcelona, Barcelona (Spain)
01/2003- 12/2007	Director of the Airway Surgical Program, and lecturer in anatomy, function and imaging of the trachea, diagnosis and treatment of benign tracheal stenosis and tracheoesophageal fistulas, surgical management of tracheal tumors, principles of pedriatric airway surgery, European School of CardioThoracic Surgery, Bergamo (Italy)
04/2000-12/2004	Director, Post-graduate (Residents & Fellows) program of general thoracic surgery, Heidehaus Hospital, Hannover Medical School, Hannover (Germany)
12/1993-04/1999	Lectures in general thoracic surgery and lung and heart-lung Transplantation, Faculty of Medicine, Paris-Sud University, Paris (France)
1/1988-12/1992	Lectures to student first and second leve, Faculty of Medicine, University of Pisa (Italy)

Clinical competence and formal training

Clinical Competence:

01/2005-12/2009	Chairman and Senior Consultant, Department of General Thoracic Surgery Hospital Clinic, University of Barcelona, Barcelona (Spain)
1/2003-12/2004	Medical Director, Heidehaus Hospital, Hannover Medical School, Hannover (Germany)
04/1999-12/2004	Chairman, Department of General Thoracic and Vascular Surgery, Heidehaus Hospital, Hannover Medical School, Hannover (Germany)
08/1995-03/1999	Consultant, Department of Thoracic and Vascular Surgery and Heart-Lung Transplantation, Hôpital Marie-Lannelongue, Paris-Sud University, Le Plessis Robinson (France)

Formal Training:

1/1992-12/1995	Fellow in Cardio-thoracic and vascular Surgery. Department of Thoracic and Vascular Surgery and Heart-Lung Transplantation, Hôpital Marie-Lannelongue, Paris-Sud University, Le Plessis Robinson (France)
1/1990–12/1991	Clinical Fellow in General Thoracic Surgery, Department of General Thoracic Surgery, University of Alabama at Birmingham, Birmingham, Alabama (USA)
10/1986-12/1990	Residency in General Surgery, Departement of Surgery, University of Pisa (Italy)

Academic distinctions

2010-2013	Visiting Professor of Regenerative Surgery, Karolinska Institutet (Sweden)
2009-2012	Honorary Professor of Surgery, University College London, London (UK)
2005-2009	Associate Professor of Surgery, University Barcellona (Spain)
2000-present	Professor of Surgery, Hannover Medical School, Hannover (Germany)
1992-1999	Lecturer at: • Institut Marie et Curie, Sorbonne University, Paris (France) • Faculty of Medicine, Paris-Sud University Paris, Paris (France) • University Franche-Compte, Beçanson (France)
1988-1992	Assistant Professor, Faculty of Medicine, University of Pisa (Italy)

Commissions of trust

Committes

1. Chairman, Research and Research Funding, European Association Cardio-thoracic Surgery (EACTS)
2. Scientific Council on Pulmonary Transplantation, International Society of Heart-Lung Transplantation
3. European Union Liaison, EACTS
2. Post-graduate Education, EACTS
3. Young Investigator Awards, EACTS

4. General Thoracic Biology Club, AATS
5. Hans Borst Award Committee, EACTS
6. Surgical Treatment of End-Stage, Cardiopulmonary Disease Committe, Society of Thoracic Surgeons

Editorial board

1. Journal of Heart-Lung Transplantation
2. Vascular and Myocardial Regeneration
3. Surgical Technology Interventional
4. Transplant International
5. International Journal for Cancer Research and Treatment
6. Lancet Oncology
7. Stem Cell Research and Treatment
8. Stem Cells Translation Medicine

Other Merits

***Memberships in Scientific and Medical Associations**:*

1. Fleishner Society, 2010-present
2. International Association for Artificial Organs, 2007- present
3. Spanish Society of Cardiothoracic Surgery, 2006- present
4. American Association of Thoracic Surgery, 2004- present
5. German Society of Thoracic and Cardiovascular Surgery, 2000-present
6. European Society of Thoracic Surgery, 2000-present
7. American College of Surgeons Oncology Group, 2000-present
8. American Association of Transplant Physician, 1999-present
9. Society of Thoracic Surgeons, 1999-present
10. French Society of Cardiothoracic Surgery, 1998-present
11. International Society of Heart-Lung Transplantation, 1997-present
12. European Association of CardioThoracic Surgery, 1996-present
13. American Association of Cancer Research, 1995-present
14. Metastasis Research Society, 1995-present
15. American Society of Clinical Oncology, 1995-present
16. International Association for the Study of Lung Cancer, 1989-present
17. European Society of Surgical Oncology, 1988-present
18. European Association for Cancer Research, 1987-present

Referees

1) Stephen F. Badylak, DVM, PhD, MD
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2) Doris A. Taylor, PhD, FAHA
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3) Dame Julia Polak, DBE, MD, DSc, FRCP, FRCPath, FMedSci,
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KAROLINSKA INSTITUTET
SCIENTIFIC PORTFOLIO

Approved by the Board of Research, January 1st 2008

AIMS

The aim of the scientific portfolio is to apply differentiated standards for the assessment of work within research and postgraduate studies that can be used for appraising competence and qualifications and for the appointment of researchers and teachers at Karolinska Institutet.

Various evaluation parameters and measurements of various levels of proficiency/ competence are used to evaluate productivity and quality among applicants for higher academic appointments. When assessing an applicant's research achievements, a distinction should be made between the criteria used for making quantitative and those for qualitative assessments. It is also important to highlight parameters which reflect creativity and vision in the researcher's work which can be of great importance within healthcare.

CONTENTS

1. Scientific production
2. Scientific collaboration and external research grants
3. Supervision of doctoral candidates/postgraduate education
4. Evaluation of others' work
5. Future research plans
6. Collaboration with the community

Scientific production

The scientific production of Macchiarini Paolo includes 114 peer reviewed original articles, 18 peer reviewed review, 51 book chapters. Papers that have been included in the PhD thesis, are listed as "PhD Thesis Article", in bold and underlined. This is detailed below.

Peer Reviewed Original Articles *

1) **Macchiarini P**, Mussi A, Angeletti CA. Intrapleural BCG in postsurgical stage I non-small cell lung cancer. *Anticancer Res* 9:391-393, 1989. (IF 1.656)

2) Angeletti CA, **Macchiarini P**, Mussi A, Basolo F. Influence of T and N stages on long-term survival in resectable small cell lung cancer. *Eur J Surg Oncol* 15: 337-340, 1989. (IF: 2.772)

3) **Macchiarini P**, Danesi R, Del Tacca M, Angeletti CA. Effects of thymostimulin on chemotherapy-induced toxicity and long-term survival in small cell lung cancer. *Anticancer Res* 9:192-196, 1989. (IF 1.656)

4) **Macchiarini P**, Mussi A, Basolo F, Bruno J, Angeletti CA. Optimal treatment of T1-3N0M0 small cell lung cancer: surgery plus adjuvant chemotherapy. *Anticancer Res* 9:1623-26, 1989. (IF 1.656)

5) **Macchiarini P**, Danesi R, Mariotti R, Fazzi P, Marchetti A, Bevilacqua G, Giuntini C, Mariani M, Del Tacca M, Angeletti CA. Phase II study of high-dose epirubicin in untreated patients with small cell lung cancer. *Am J Clin Oncol* 13: 302-307, 1990. (IF 1.768)

6) **Macchiarini P**, Chella A, Riva A, Mengozzi G, Silvano G, Solfanelli S, Angeletti CA. Phase II feasibility study of high-dose epirubicin-based regimens for untreated patients with small cell lung cancer. *Am J Clin Oncol* 13: 495-500, 1990. (IF 1.768)

7) **Macchiarini P**, Hardin M, Basolo F, Bruno J, Angeletti CA. Adjuvant chemotherapy for T1-T2N0M0 small cell lung cancer: single-agent or combination chemotherapy? *Cancer Invest* 9:19-25, 1991. (IF 2.390)

8) **Macchiarini P**, Hardin M, Basolo F, Bruno J, Chella A, Angeletti CA. Surgery plus adjuvant chemotherapy for T1-3N0M0 small cell lung cancer: rationale for current treatment. *Am J Clin Oncol* 14: 218-224, 1991. (IF 1.768)

9) **Macchiarini P**, Buonaguidi R, Hardin M, Mussi A, Angeletti CA. Results and prognostic factors of surgery in the management of non-small cell lung cancer with solitary brain metastasis. *Cancer* 68:300-304, 1991. (IF 5.131)

* *IF (Impact Factor, as per 2010)*

10) Geneste O, Cmus AM, Castegnaro M, Petruzzeli S, **Macchiarini P**, Angeletti CA, Giuntini C, Bartsch H. Comparison of pulmonary DNA adduct levels, measured by ^{32}P-postlabelling, and arly hydrocarbon hydroxylase activity in lung parenchyma of smokers and ex-smokers. *Carcinogenesis* 12: 1301-1305, 1991. (IF 5.402)

11) **Macchiarini P**, Hardin M, Angeletti CA. Long-term evaluation of intrapleural Bacillus Calmette and Guerin with or without adjuvant chemotherapy in completely resected stages II and III non-small cell lung cancer. *Am J Clin Oncol* 14: 291-297, 1991. (IF 1.768)

12) **Macchiarini P**, Janni A, Mussi A, Silvano G, Chella A, Angeletti CA. Results of treatment and lessons learned from pathologically staged T4 non-small-cell lung cancer. *J Surg Oncol* 47: 209-214, 1991. (IF 2.384)

13) **Macchiarini P**, Chella A, Ducci F, Rossi B, Testi C, Bevilacqua G, Angeletti CA. Neoadjuvant chemotherapy, surgery and post-operative radiotherapy for invasive thymoma. *Cancer* 68: 706-713, 1991. (IF 5.131)

14) Angeletti CA, Janni A, **Macchiarini P**, Ricagna F, Pistelli G. Functional results of sleeve lobectomy. *Eur J Cardio-thorac Surg* 5:410-413, 1991. (IF 2.293)

15) Chiarugi M, Buccianti P, Goletti O, **Macchiarini P**. Post-traumatic post-aneurysm of the hepatic artery. *Injury* 22: 425-426, 1991. (IF 2.269)

16) Danesi R, Bernardini N, Agen C, Costa M, **Macchiarini P**, Della Torre P, Del Tacca M. Cardiotoxicity and cytotoxicity of the anthracycline analog 4'-deoxy-4'-iodo-doxorubicin. *Toxicology* 70:243-253, 1991. (IF 3.641)

17) Fontanini G, **Macchiarini P**, Pepe S, Ruggiero A, Hardin M, Bigini D, Vignati S, Pingitore R, Angeletti CA. The expression of proliferating cell nuclear antigen in paraffin sections of peripheral, node-negative non-small cell lung cancer. *Cancer* 70:1520-1527, 1992. (IF 5.131)

18) **Macchiarini P**, Fontanini G, Hardin M, Squartini F, Angeletti CA. Relation of neovascularization to metastasis in non-small cell lung cancer. *Lancet* 340:145-146, 1992. (IF 33.633)

19) **Macchiarini P**, Fontanini G, Hardin M, Pingitore R, Angeletti CA. Most peripheral, node-negative non-small cell lung cancer have absence of intratumoral and peritumoral blood and lymphatic vessel invasion and low proliferative rates: Rationale for treatment with wedge resection alone. *J Thorac Cardiovasc Surg* 104: 892-899, 1992. (IF 3.608)

20) Fontanini G, Pingitore R, Bigini D, Vignati S, Pepe S, Ruggiero A, **Macchiarini P**. Growth fraction in non-small cell lung cancer estimated by proliferating cell nuclear antigen and comparison with Ki-67 labeling and DNA flow cytofluorimetric data. *Am J Pathol* 141:1285-1290, 1992. (IF 5.224)

21) Goletti O, Bucciante P, Chiarugi M, **Macchiarini P**. Subcutaneous implantation of liver metastasis after fine needle aspiration. *Eur J Surg Oncol* 18:636-637, 1992. (IF 2.772)

22) **Macchiarini P,** Dartevelle P, Chapelier A, Lenot B, Cerrina J, Ladurie Le Roy F, Parquin F. Technique for resecting primary or metastatic non-bronchogenic tumors of the thoracic outlet. *Ann Thorac Surg* 55:611-618, 1993. (IF 3.558)

23) Parquin F, Cerrina J, Le Roy Ladurie F, Brenot F, Herve P, **Macchiarini P**, Simoneau G, Lenot B, Chapelier A, Dartevelle P. Comparison of hemodynamical outcome of patients with pulmonary hypertension after lung or heart-lung transplantation. *Transplant Proc* 25:1157-1158, 1993. (IF 0.993)

24) **Macchiarini P**, Chapelier A, Lenot B, Cerrina J, Dartevelle P. Laryngotracheal resection and reconstruction for post-intubation subglottic stenosis. *Eur J Cardio-thorac Surg* 7:300-305, 1993. (IF 2.293)

25) Dartevelle P, Chapelier A, **Macchiarini P**, Lenot B, Cerrina J, Ladurie F, Parquin F, Lafont D. Anterior transcervical approach for radical resection of lung tumors invading the thoracic inlet. *J Thorac Cardiovasc Surg* 105:1025-1034, 1993. (IF 3.608)

26) **Macchiarini P**, Fontanini G, Hardin M, Hsu C, Bigini D, Vignati S, Pingitore R, Angeletti CA. Blood vessel invasion by tumour cells predicts recurrence in completely resected T1N0M0 non-small cell lung cancer. *J Thorac Cardiovasc Surg* 106:80-89, 1993. (IF 3.608)

27) Marchetti A, Buttitta F, Merlo G, Diella F, Pellegrini S, Pepe S, **Macchiarini P**, Chella A, Angeletti CA, Callahan R, Bistocchi M, Squartini F. p53 alterations in non small cell lung cancers correlates with metastatic involvement of hilar and mediastinal lymph nodes. *Cancer Res* 53:2846-2851, 1993. (IF 8.234)

28) **Macchiarini P**, Delamare N, Cerrina J, Dulmet E, Chapelier A, Dartevelle P. Tracheoesophageal fistula caused by mycobacterial tuberculosis adenopathy. *Ann Thorac Surg* 55:1561-1563, 1993. (IF 3.558)

29) Chapelier A, Vouhé P**, Macchiarini P,** Lenot B, Cerrina J, Le Roy Ladurie F, Parquin F, Herve P, Brenot F, Lafont D, Simonneau G, Dartevelle P. Comparative outcome of heart-lung and lung transplantation for pulmonary hypertension. *J Thorac Cardiovasc Surg* 106:299-307, 1993. (IF 3.608)

30) Fontanini G, Bigini D, Vignati S, **Macchiarini P,** Pepe S, Angeletti CA, Pingitore R, Squartini F. p53 expression in non-small cell lung cancer: Clinical and biological correlations. *Anticancer Res* 13:737-742, 1993. (IF 1.656)

31) Dulmet E, **Macchiarini P**, Suc B, Verley JM. Germ cell tumors of the mediastinum. *Cancer* 72:1894-1901, 1993. (IF 5.131)

32) Lenot B, **Macchiarini P**, Dulmet E, Weiss M, Dartevelle P. Tracheal allograft replacement: an unsuccessful method. *Eur J Cardio-thorac Surg* 7:648-652, 1993. (IF 2.293) **PhD Thesis Article**

33) **Macchiarini P,** Chapelier A, Monnet I, Vannetzel JM, Rebischung JL, Cerrina J, Parquin F, Le Roy Ladurie F, Lenot B, Dartevelle P. Extended operations after induction therapy for T4 non-small cell lung cancer. *Ann Thorac Surg* 57:966-973, 1994. (IF 3.558)

34) Chapelier A, **Macchiarini P**, Rietgens M, Lenot B, Margulis A, Petit JY, Dartevelle P. Chest wall reconstruction following resection of large primary malignant tumors. *Eur J Cardio-thorac Surg* 8:351-357, 1994. (IF 2.293)

35) **Macchiarini P**, Fontanini G, Dulmet E, Montpreville V, Chapelier A, Cerrina J, le Roy Ladurie F, Dartevelle P. Angiogenesis, an indicator of metastasis in non-small cell lung carcinomas involving the thoracic inlet. *Ann Thorac Surg* 57:1534-1539, 1994. (IF 3.558)

36) **Macchiarini P,** Chapelier A, Vouhé P, Cerrina J, Le Roy Ladurie F, Parquin F, Brenot F, Simonneau G, Dartevelle P. Double-lung transplantation for *situs inversus* with Kartagener's syndrome. *J Thorac Cardiovasc Surg* 108:86-91, 1994. (IF 3.608)

37) **Macchiarini P,** Lenot B, de Montpreville V, Dulmet E, Mazmanian GM, Fattal M, Guiard F, Chapelier A, Dartevelle P. Heterotopic pig model for direct revascularization and venous drainage of tracheal allografts. *J Thorac Cardiovasc Surg* 108:1066-1075, 1994. (IF 3.608) **PhD Thesis Article**

38) **Macchiarini P,** Dulmet E, de Montpreville V, Chapelier A, Cerrina J, Le Roy Ladurie F, Dartevelle P. Prognostic significance of peritumoral blood and lymphatic vessel invasion by tumor cells in T4 non-small cell lung cancer following induction therapy. *Surg Oncol* 4:91-99, 1995. (IF 2.886)

39) **Macchiarini P**, Mazmanian GM, Montpreville V, Dulmet E, Fattal M, Lenot B, Chapelier A, Dartevelle P. Experimental tracheal and tracheo-esophageal allotransplantation. *J Thorac Cardiovasc Surg* 110:1-10, 1995. (IF 3.608) **PhD Thesis Article**

40) Fadel E, Chapelier A, Cerrina J, **Macchiarini P,** Dartevelle P. Vascular ring causing symptomatic tracheal compression in adulthood. *Ann Thorac Surg* 60:1411-1413, 1995. (IF 3.558)

41) **Macchiarini P**, Mazmanian GM, De Montpreville V, Dulmet E, Chapelier A, Dartevelle P. Maximal preservation time of tracheal allografts. *Ann Thorac Surg* 60:1597-1604, 1995. (IF 3.558) **PhD Thesis Article**

42) Montpreville V, **Macchiarini P,** Dulmet E. Thymic neuroendocrine (carcinoid) carcinoma: A clinicopathological study of fourteen cases. *J Thorac Cardiovasc Surg* 111:134-141, 1996. (IF 3.608)

43) Montpreville V, **Macchiarini P**, Dartevelle P, Dulmet E. Large bilateral pulmonary artery aneurysms in Behçet's disease: Rupture of the contralateral lesion after aneurysmorrhaphy. *Respiration* 63:49-51, 1996. (IF 2.543)

44) Fadel E, Chapelier A, Cerrina J, Le Roy Ladurie, **Macchiarini P,** Dertevelle P. Intrathoracic goiters: 62 surgically treated. *Presse Med* 25:787-792, 1996. (IF 0.485)

45) **Macchiarini P**, Mazmanian M, Montpreville V, Dulmet E, Chapelier A, Dartevelle P. Tracheal growth after slide tracheoplasty. *J Thorac Cardiovasc Surg* 113:558-566, 1997. (IF 3.608)

46) Chapelier A, Bacha E, Montpreville V, Dulmet E, Rietjens M, Margulis A**, Macchiarini P**, Dartevelle P. Radical resection of radiation-induced sarcoma of the chest wall: Report of 15 cases. *Ann Thorac Surg* 63:214-219, 1997. (IF 3.558)

47) **Macchiarini P**, Mazmanian M, Oriol R, Montpreville V, Dulmet E, Rieben R, Doubin S, Libert JM, Fattal S, Daha R, Dartevelle P. Ex-vivo pig model of lung hyperacute rejection. *J Thorac Cardiovasc Surg* 114(3):315-325, 1997. (IF 3.608) **PhD Thesis Article**

48) Dartevelle P, Fadel E, Chapelier A**, Macchiarini P**, Cerrina J, Leroy-Ladurie F, Parquin F, Simonneau F, Parent F, Humbert M, Simonneau G. Traitement chirurgical de la maladie thromboembolique pulmonaire chronique. *Sang, Thromb Vaiss* 4:241-250, 1997. (IF 0.133)

49) de Montpreville V, **Macchiarini P**, Dartevelle P, Dulmet E. Large bilateral pulmonary arterial aneurysms and endomyocardial fibrosis in Behcet's disease. *Cardiovascular Pathobiology* 3:125-131, 1997. (IF 1.800)

50) Bacha E, Chapelier A, **Macchiarini P,** Fadel E, Dartevelle P. Surgery for invasive primary mediastinal tumors. *Ann Thorac Surg* 66:234-239, 1998. (IF 3.558)

51) Houel R, Serraf A, **Macchiarini P**, Bruniaux J, Planche C. Tracheoplasty in congenital tracheal stenosis. *Int J Pediatr Otorhinolaryngol* 44:31-38, 1998. (IF 1.067)

52) **Macchiarini P,** Oriol R, Azimzadeh A, Rieben R, Bovin N, Mazmanian M, Dartevelle P. Evidence of human non-αGal antibodies involved in the hyperacute rejection of pig lungs and their removal by pig organ perfusion. *J Thorac Cardiovasc Surg* 116:831-43, 1998. (IF 3.608) **PhD Thesis Article**

53) Dartevelle P, Fadel E, Chapelier A, **Macchiarini P**. Pulmonary thromboendarterectomy with video-angioscopy and circulatory arrest: an alternative to cardiopulmonary transplantation for post-embolic pulmonary artery hypertension. *Chirurgie* 123:32-40, 1998.

54) **Macchiarini P,** Le Roy Ladurie F, Cerrina J, Fadel E, Chapelier A, Dartevelle P. Clamshell or sternotomy for double lung or heart-lung transplantation. *Eur J Cardiothoracic Surg* 15; 333-339, 1999. (IF 2.293)

55) Fadel A, Chapelier A, Cerrina J, Le Roy Ladurie F, **Macchiarini P,** Dartevelle P. Subclavian artery resection and reconstruction for thoracic inlet cancers. *J Vasc Surg* 29:581-588, 1999. (IF 3.851)

56) **Macchiarini P**, Wain J, Almy S, Dartevelle P. Experimental and clinical evaluation of a new synthetic, absorbable sealant to reduce air leaks in thoracic surgery. *J Thorac Cardiovasc Surg* 117:751-758, 1999. (IF 3.608)

57) **Macchiarini P**, Oriol R, Azimzadeh A, de Montpreville V, Wolf P, Dartevelle P. Characterization of a pig-to-goat orthotopic lung xenotransplantation model to study beyond hyperacute rejection. *J Thorac Cardiovasc Surg* 118(5):805-814, 1999. (IF 3.608) **PhD Thesis Article**

58) Gorti GK, Birchall MA, Haverson K, **Macchiarini P**, Bailey M. A preclinical model for laryngeal transplantation: Anatomy and mucosal immunology of the porcine larynx. *Transplantation* 68:1638-1642, 1999. (IF 3.676)

59) Dartevelle P, Fadel E, Chapelier A**, Macchiarini P**, Cerrina J, Parquin F, Simonneau F, Simonneau G. Angioscopic video-assisted pulmonary endarterectomy for post-embolic pulmonary hypertension. *Eur J Cardiothorac Surg* 16:38-43, 1999. (IF 2.293)

60) **Macchiarini P**, Verhoye P, Chapelier A, Fadel E, Dartevelle P. Evaluation and outcome of different surgical techniques for postintubation tracheoesophageal fistula. *J Thorac Cardiovasc Surg* 119:268-176, 2000. (IF 3.608)

61) Kuhn K, Pasch S, Wojciechowski W, **Macchiarini P**. Combined sleeve lobectomy and Ivor Lewis esophagectomy for a synchronous primary lung and Barret's esophagus. *J Thorac Cardiovasc Surg* 119:1289-90, 2000. (IF 3.608)

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47) Baiguera S, Jaus M, Gonfiotti A, **Macchiarini P**. Trachea and Larynx in Regenerative Medicine. In: *Biomaterials for stem cell therapy: state of art and vision for the future* (De Bartolo L, Bader A ed.) Science Publishers (USA) (*in press*).

48) Baiguera S, **Macchiarini P**. Regenerative Therapies-Trachea. In: *Regenerative Medicine – From Protocol to Patient. (2nd edition)* (G Steinhoff, *ed.*), Springer Publ., London, UK (*in press*).

49) Baiguera S, Damasceno KL, **Macchiarini P**. Detergent-enzymatic method for bioengineering human airways. In: *Organ Perfusion and Culture Methodology. Methods in Bioengineering* (Lee C, Uygun K, *eds.*) M. Yarmush e R. Langer. Boston, USA *(in press).*

50) Lemon G, King JR, **Macchiarini P**. Mathematical modelling of regeneration of a tissue-engineered trachea. In: *Studies in Mechanobiology, Tissue Engineering and Biomaterials* (Gefan Amit, *ed.*). Springer AG, Heidelberg (*in press*).

51) Jungebluth P, **Macchiarini P**. Clinical potential of mesenchymal stem cells for treatment of lung diseases. In: *Advances in Biochemical Engineering/Biotechnology: Mesenchymal stem cells - origin and characteristics, functions and perspectives for clinical use* (P Vogt, *ed.*) Springer Verlag, Berlin *(in press).*

Invited speaker (in the past 10 years)

1) International training of a general thoracic surgeon. Thoracic surgery postgraduate course. *87th American College of Surgeons*, New Orleans (USA), October 18, 2001.

2) Surgical management of the subglottic airway. *Royal Bristol Infirmary*. University of Bristol, Bristol (UK), November 12, 2001.

3) The bioartificial Lung. *31st Annual Meeting German Society for Thoracic and Cardiovascular Surgery.* Leipzig (Germany) February 17-20, 2002.

4) Advances in tracheal surgery. *5th Congress Turkish Thoracic Society*. Antalaya (Turkey) April 24-28, 2002.

5) Pulmonary Thromboendarterectomy. *5th Congress Turkish Thoracic Society*. Antalaya (Turkey) April 24-28, 2002.

6) Superior sulcus tumors. *NATO- advanced research seminar in thoracic oncology*. Kroshnava (Russia). April 29, 2002.

7) Chronic thromboembolic pulmonary disease. *Institute of Pneumology and Thoracic Surgery. University of Barcelona*, Barcelona (Spain), May 14, 2002.

8) Recent advances in tracheal surgery. *Institute of Pneumology and Thoracic Surgery. University of Barcelona*, Barcelona (Spain), May 14, 2002

9) Apnoeic tracheal surgery. *General Thoracic Surgery Post-graduate Course EACTS*, Monaco (Montecarlo), September 22, 2002.

10) Pancoast Tumors. *Post-graduate course in General Thoracic Surgery. German Society for Thoracic and Cardiovascular Surgery*. Kiel (Germany), October 8, 2002.

11) Pulmonary thromboendarterectomy. University of Palermo. Palermo (Italy), November 8, 2002.

12) Surgery of the superior vena cava. Deep venous surgery and new technologies for varicose veins. *Updating Course in Vascular Pathology of Surgical Interest*. III Edition. University of Pisa (Italy). November 30-December 1, 2002.

13) How I do it: Carinal resections. Post-graduate Course General Thoracic Surgery. *83rd AATS Meeting*. Boston (USA), May 3rd, 2003.

14) Trachea substitutes. *3rd Sheffield Seminar in Thoracic Surgery.* Sheffield (UK), May 15th-16th, 2003.

15) Principles of cardiopulmonary bypass, ECMO, artificial lung. *European School of Cardiothoracic surgery*. Bergamo (Italy), June 2, 2003.

16) Surgery of the upper thoracic aperture. *1st Post-graduate course of the German-Italian Thoracic surgery*. Bolzano (Italy), November 21-22 2003.

17) Implication of interferon-β on the mediastinal lymphangiogenesis. *Post-graduate course of the* 26th *German Oncology Congress*. Berlin (Germany), Februar 28-March 2, 2004.

18) Conferencia entre especialidades médicas relacionadas: conflicto o viabilidad. VIII Foro Cardiovascular. Madrid (Spain), March 11-12, 2005.

19) Conferencia Magistral: Tratamiento quirúrgico y endoscópico del enfisema pulmonar. 23 Diada Pneumològica de la Sociedad Catalana de Pneumologia (SOCAP). Sant Cugat (Spain), April 8-9, 2005.

20) XII Annual Meeting of the German Society of Thoracic Surgery. Berlin (Germany), June 1-5, 2005.

21) Tratamiento actual de la hipertensión pulmonar tromboembólica crónica: Opciones quirúrgicas. Congreso Anual de la Sociedad Española de Neumología y Cirugía Torácica (SEPAR). Valencia (Spain), June 10-13, 2005.

22) Advances in chronic thromboembolic pulmonary hypertension: Experience of the spanish groups. VIII Annual Meeting of the Pulmonary Circulation Working Group Spanish Society of Cardiology. Alicante (Spain), November 11, 2005.

23) La Chirurgia della trachea: indicazioni e problematiche. II Giornata di Patologia Toracica. Catania (Italy), February 23-26, 2006.

24) The actual status of the artificial lung. 2nd General Thoracic Surgery Course. Bursa (Turkey), June 15-17, 2006.

25) Surgical Management of airway disease. British resident annual meeting. Crew (UK), February 3, 2006.

26) La Chirurgia della trachea: indicazioni e problematiche. *II Giornata di Patologia Toracica.* Catania (Italy), February 23-26, 2006.

27) Tratamiento multimodal del tumor de pancoast. *3ª Jornada de Radioquimioterapia en el Cáncer de Pulmón*. Barcelona (Spain), April 21, 2006.

28) Tissue engineered trachea. *Annual meeting of the Japanese Society of Chest Surgery*. Tokyo (Japan) May 25-27, 2006.

29) The actual status of the artificial lung. *2nd General Thoracic Surgery Course*. Bursa (Turkey), June 15-17, 2006.

30) Trachea surgery in children. *2nd General Thoracic Surgery Course*. Bursa (Turkey), June 15-17, 2006.

31) Limits of airway surgery. *2nd General Thoracic Surgery Course*. Bursa (Turkey), June 15-17, 2006.

32) Utilización de transplante de vasos cadavéricos en el tratamiento quirúrgico de los tumores intratorácicos. *III Congreso Oncológico para Profesionales Sanitarios*. Benavente (Spain), October 20-21, 2006.

33) Tratamiento quirúrgico de la hipertensión arterial pulmonar. Hipertensión Pulmonar. *IV Curso práctico de actualización cardiovascular.* Barcelona (Spain), November 2-3, 2006.

34) Tumor primitivi della via aerea superiore. *XI Sessione. NSCLC-Terapia Chirurgia. Congresso Oncologia Toracica. Lo stato dell'arte alla fine del 2006*. Bari (Italy), 30 Noviember – 2 December, 2006.

35) État actuel de la chirurgie trachéal. *Congreso de la Société Marocaine des Maladies Respiratoires.* Fez (Marrocco), March 2-4, 2007.

36) Cirugía de los tumores T4. *Congreso de la Société Marocaine des Maladies Respiratoires.* Fez (Marrocco), March 2-4, 2007.

37) Rare tumors: Chest wall tumors. *ESMO International Symposium (EIS) of Chest Tumors*. Geneva (Switzerland), 30 March – 1 April, 2007.

38) Cirugía de los tumors de pancoast. Mesa de Cirugía I: Recursos Técnicos en Cirugía Torácica. *Congreso Sociedad Madrileña de Neumología y Cirugía Torácica.* Madrid (Spain), April 12-13, 2007.

39) Resección de la carina traqueal: planteamiento teórico. *Curso de Actualización en Técnicas Quirúrgicas Torácicas*. Salamanca (Spain), May 29-30, 2007.

40) Resección y reconstrucción de la vena cava superior. Enfermedad Vascular Pulmonar. *Curso FMC-SEPAR*. Castelldefels (Spain), October 5-6, 2007.

41) Resección de Carina. *Programa Simposio Cirugía de Torax Camilo Schrader Fajardo. Instituto Nacional de Cancerologia.* Medellín (Colombia), October 11-14, 2007.

42) Avances en cirugía de tráquea. *Simposio Cirugía de Torax Camilo Schrader Fajardo. Instituto Nacional de Cancerologia*. Medellín (Colombia), October 11-14, 2007.

43) Implante de vasos cadavéricos en cirugía de tórax. *Simposio Cirugía de Torax Camilo Schrader Fajardo. Instituto Nacional de Cancerologia*. Medellín (Colombia), October 11-14, 2007.

44) Tratamiento quirúrgico del http por TEP recurrente. *Simposio Cirugía de Torax Camilo Schrader Fajardo. Instituto Nacional de Cancerologia*. Medellín (Colombia), October 11-14, 2007.

45) Novalung: Asistencia pulmonar. *Simposio Cirugía de Torax Camilo Schrader Fajardo. Instituto Nacional de Cancerologia*. Medellín (Colombia), October 11-14, 2007.

46) Manejo quirúrgico de las estenosis subglóticas benignas y malignas en niños y adultos. *XXIX Curso Internacional de la SMORL y CCC (Sociedad Mexicana de Otorrinolaringología y Cirugía de la Cabeza y Cuello)*. México D.F. (México), February 14-16, 2008.

47) Traqueotomía mediastinal, indicaciones y técnica quirúrgica. *XXIX Curso Internacional de la SMORL y CCC (Sociedad Mexicana de Otorrinolaringología y Cirugía de la Cabeza y Cuello)*. Ciudad de México (México), February 14-16, 2008.

48) Conferencia Magistral: Estado actual y futuro del tratamiento de la estenosis laringotraqueal (Transplante, biología molecular, inmunología e ingeniería de tejidos de la vía aérea*). XXIX Curso Internacional de la SMORL y CCC (Sociedad Mexicana de Otorrinolaringología y Cirugía de la Cabeza y Cuello)*. México D.F. (México), February 14-16, 2008.

49) Conferencia Inagural: Asistencia Ventilatoria Extracoporal. *Ier Seminario Cuidados Respiratorios*. Ciudad Real (Spain), February 27-29, 2008.

50) The technological improvements in Thoracic Surgery practice. *11th Annual Congress of the Turkish Thoracic Society*. Belek-Antalya (Turkey), April 23-27, 2008.

51) Carina involvement and the management of satellite nodule. *11th Annual Congress of the Turkish Thoracic Society*. Belek-Antalya (Turkey), April 23-27, 2008.

52) Presentación teórica: Cómo lo hago. Abordaje transpericárdico de la carina traqueal. *II Curso Avanzado de Cirugía Torácica. Hospital Universitario de Salamanca.* Salamanca (Spain), June 16-18, 2008.

53) Sistema de intercambio de gases extracorporales. *Módulo de Patología de Alta complejidad. Master de Medicina Respiratoria.* Universidad de Barcelona. Sede de la Sociedad Españaola de Neumología y Cirugía Torácica (SEPAR), Barcelona (Spain), June 21, 2008.

54) Soporte respiratorio extra-corporal. *XV Curso de actualización en cuidados intensivos respiratorios para enfermería.* Hospital Clínic - Universidad de Barcelona (Spain), October 13-17, 2008.

55) Soporte extracorporeo para la insuficiencia respiratoria aguda. *VI Simposio Asociación Colombiana de Medicina Crítica y Cuidado Intensivo*. Santiago de Cali (Colombia), November 6-8, 2008.

56) Soporte extracorporeo como puente al transplante pulmonar. *VI Simposio Asociación Colombiana de Medicina Crítica y Cuidado Intensivo.* Santiago de Cali (Colombia), November 6-8, 2008.

57) Tissue engineering in Chirurgia Toracica: quo vadis. II Sessione Nuove Tecnologie in Endoscoia e Chirurgia Toracica. *Congresso Nuove Tecniche e Nuove Tecnologie in Patologia Toracica. Barletta* (Italy), December 5-6, 2008.

58) Thoraxchirurgie. *Stadienadaptierte Standards in der Thoraxchirurgie. Hanover Meeting*, Hannover (Germany), January 16-17 , 2009

59) Bionic Airways Surgery. *The Royal Society of Medicine*. London (UK), January 21, 2009.

60) Transplantament pulmó. *Master Transplantament d'Organs*. Universitat de Barcelona, Facultad de Medicina, Barcelona (Spain), February 9, 2009.

61) Patología de la tráquea. *V Symposium Internacional "Neumología Siglo XXI".* Madrid (Spain), February 26, 2009.

62) ¿Qué ha cambiado en cirugía torácica? Células madre y pulmón: la experiencia de la tráquea. *Congreso Neumotoxa*. La Toja, Vigo (Spain), Febuary 26-28, 2009.

63) Tracheo-bronchial transplantation. ESTS – *European Society of Thoracic Surgeons*. Elancourt, Paris (France) March 2-3, 2009.

64) Airway Transplantation. *Transplant Services Foundation* (TSF), Barcelona (Spain), March 11, 2009.

65) Lessons learned from the first completely tissue engineered organ (the windpipe). 4th *World Congress on Regenerative Medicine.* Bangkok (Thailand), March 12-14, 2009.

66) Il futuro dei trapianti clinici con tessuti ingegnerizzati. *8º Corso di formazione avanzata. Medicina Rigenerativa cellulare: realtà e prospettive.* Collegio Ghislieri , Pavia (Italy). March 20, 2009.

67) Artificial lung: quo vadis? 5th *Scientific Meeting: Assist Devices-Bridge to Life.* Eugenides Foundation, Athens (Greece), March 21, 2009.

68) Tissue engineered tracheal transplantation and cell restoration: techniques, indications, and perspectives. *5th Scientific Meeting: Assist Devices-Bridge to Life*. Eugenides Foundation, Athens (Greece), March 21, 2009

69) Tissue engineered cell restoration and replacement. *I Setmana de la Recerca,* Facultad de Medicina, Universitat de Barcelona, Barcelona (Spain), March 25, 2009.

70) Tra cardiochirurgia e Chirurgia toracica: i tumori con infiltrazione di cuore o vasi. Chi operare, come pianificare l'intervento, come operare. *Complicanze cardiovascolari in oncologia: ieri ed oggi. La gestione delle problematiche*. Napoli (Italy), March 26, 2009.

71) Bioengineering organs and tissues cell restoration. *Committee for Advance Therapies (CAT).* European Medical Agency. London (UK), April 16, 2009.

72) Future of Regenerative Medicine. *VI Reunión Nacional de Coordinadores de Trasplantes.* Zaragoza (Spain), April 17, 2009.

73) Tissue and cell engineering. Annual Meeting of INFARMED Ministry of Healt (Medicamentos e productos de saude: Inovacao, acessibilitade e sustentabilidade). Lisboa (Portugal), May 15, 2009.

74) Pulmonary Hypertension. *40th Annual congress of the Italian Association of Nonacademic Cardiologist*. Firenze (Italy), June 4-7, 2009.

75) From Bench to bedside. *The NHS Healthcare Innovation Expo*. London (UK), June 18, 2009.

76) Tissue engineering airways. *The NHS Healthcare Innovation Expo*. London (UK), June 18, 2009.

77) Airway surgery. *Convegno nazionale di pneumologia intervenzionistica*. Firenze (Italy), June 19, 2009.

78) Role and fate of autologous cells in whole tissue-engineered airway replacement. *International Society for Stem Cell Reserach (ISSRS)* 7th Annual Meeting, Barcelona (Spain), July 10, 2009.

79) Translating tissue engineering into clinical transplantation: time has come. *14th Congress of the European Society Organ Transplantation*, Paris (France), August 30, 2009.

80) Putting life to science. *The knowledge triangle shaping the future of Europe*. Goteborg (Sweden), September 1, 2009.

81) Bench to Bedside: Stem Cells Transplantation. *2nd annual Stem Cells & Regenerative Medicine Europe conference*. Edinburgh (Scotland), September 25, 2009.

82) Transplante de trachea. *XVII Congreso de la Asociacion Iberoamericana de Cirurgia Toracica.* Sevilla (Spain), October 1, 2009.

83) Tissue engineering as alternative to improve transplants outcome. *V Congresso de la Sociedad de Terapia genica y cellular*. Granada (Spain), October 2, 2009.

84) Stem cell restoration and replacement of the airway and lungs. *Focus on Cell Therapy, Transplantation and Tissue Repair*. Bergamo (Italy), October 10, 2009.

85) Tissue engineering cell restoration and replacement. *Conference of the EACTS on advanced therapies in general thoracic surgery.* Wien (Austria), October 21, 2009.

86) Airway tissue engineering. *World Conference in Regenerative Medicine*. Leipzig (Germany), October 30, 2009.

87) Medicina Regenerativa en Vías Respiratorias.*1st Symposium on Translational Regenerative Medicine*. Vitoria (Spain), October 31, 2009.

88) Airways and lung tissue engineering and cell repair. *19th Congress of the World Society of Cardio-Thoracic Surgeons.* Buenos Aires (Argentina), November 4-6, 2009

89) Advances in airway surgery. *19th Congress of the World Society of Cardio-Thoracic Surgeons.* Buenos Aires (Argentina), November 4-6, 2009.

90) Surgery for advanced lung cancer. *19th Congress of the World Society of Cardio-Thoracic Surgeons.* Buenos Aires (Argentina), November 4-6, 2009.

91) Beyond translational regenerative medicine. Karolinska Institut. Stockholm (Sweden), November 12, 2009.

92) Bionic tissue engineering. *2nd Annual Commercial Translation of Regenerative Medicine*. London (UK) December 3-4, 2009.

93) Bionic airway engineering and lung restoration. *First International Conference in Regenerative Surgery*. Roma (Italy), December 10, 2009.

94) Advanced surgery for locally advanced non-small cell lung cancer. *Update NSCLC.* Hannover (Germany), December 12, 2009.

95) Progress and Perspectivas in Regenerative Medicine. *University of Modena*. Modena (Italy), January 13, 2010.

96) Progress in airway surgery. *46th Annual Meeting of the Society of Thoracic Surgeon (Techno-College Post-graduate course).* Fort Lauderdale (USA), January 23, 2010.

97) Regenerative Medicine-principles and tasks. *Russian Royal Academy of Science,* Moskow (Russia), February 19, 2010.

98) Novel Approaches to Whole Organ Tissue Engineering. *Nanomedicine: Visions for the Future,* Amsterdam (Netherlands), February 25, 2010.

99) Tracheobronchial transplantation. *Turkish Society of Pneumology and Thoracic Surgery,* Uludag (Turkey), March 14-16, 2010.

100) The artificial lung. *Turkish Society of Pneumology and Thoracic Surgery,* Uludag (Turkey), March 14-16, 2010.

101) Tracheal Reconstruction with Tissue Engineered Airway. *90th Annual Meeting of the American Association of Thoracic Surgery (Postgraduate Course)* Toronto (Canada), May 1-5, 2010.

102) How to translate the science to a viable medical treatment. *Word stem cells and regenerative medicine congress.* London (UK), May 11-13, 2010

103) Indications and therapy of primary malignant cardiac tumors. *5th Annual Meeting of the Italian Society of Cardiology and Clinical Echography.* Ancona (Italy), May 7, 2010.

104) Clinical tissue engineering: the 1st adult stem cell grown trachea transplant. *5th International Annual Meeting of Portuguese Society for Stem Cells and Cellular Therapies (SPCE-TC),* AvePark, Taipas-Guimarães (Portugal), May 20-21, 2010.

105) Whole organ tissue engineering transplantation. *International Society of Cell Therapy*, Philadelphia (USA), May 24-26, 2010.

106) T4 NSCLC Invading the Great Vessels and Heart. *General Thoracic Surgery Harvard Medical School Course*, Boston (USA), May 27-28, 2010.

107) Carinal resection for NSCLC. *General Thoracic Surgery Harvard Medical School Course*, Boston (USA), May 27-28, 2010.

108) Current status of the artificial lung. *General Thoracic Surgery Harvard Medical School Course*, Boston (USA), May 27-28, 2010.

109) Management of Benign Tracheoesophageal Fistula. *General Thoracic Surgery Harvard Medical School Course*, Boston (USA), May 27-28, 2010.

110) Oncologia Toracica; Cancro polmonare non a piccole cellule. Tecniche innovative nella resezione carenale. *Associazione Italiana Pneumologi Ospedalieri*. Florence (Italy) June 11-12, 2010.

111) Pediatric airway tissue engineering. Royal Academy of Medicine. London (UK) July 11, 2010.

112) Regenerative airway replacement. *Russian Academy of Science*. Moscow (Russia) July 21, 2010

113) Differences between in vitro and in vivo stem cell characterization and activation for windpipe transplantation. *Seoul Symposium on Stem Cell Research.* Seoul (North Corea), August 25, 2010.

114) Stem Cell Symposium. Airway tissue engineering. *5th young European scientist meeting*. Porto (Portugal) September 24-26, 2010.

115) Airway Tissue Engineered Replacement and Cell Therapy. *5th World Congress on Preventive & Regenerative Medecine*. Hannover (Germany), October 5-7, 2010.

116) Bioengineering the airway. *University California Davis,* Sacramento (USA) October 13, 2010.

117) Progres en ingenierie bio-tissulaire du remplacement des voies aeriennes et therapie cellulaire. *Academie Nationale de Medicine*. Paris (France) October 26, 2010

118) Airway Transplantation. *University of Bursa*, Bursa (Turkey). November 5, 2010

119) Surgical strategies and results in the era of the multidisciplinary approach. *XXV National Congress Italian Society for Cardiac Surgery*. Rome (Italy) November 6-9, 2010.

120) Whole-organ stem cell transplantation of the larynx. *Association for Research in Otolaryngology*. Baltimore (USA) February 22, 2011.

121) Advances in regenerative airway cell therapy and tissue engineering. *Faculty of Medicine*. Krasnodar (R) February 25, 2011.

122) Tissue Engineered Airway Replacement and Cell Therapy. *Sixth John Vane Memorial Symposium on Prostacyclin Science and Pulmonary Vascular Disease*. London (UK) March 26, 2011.

123) Decellularised Lungs lungs. *3rd Lung Regeneration Workshop, United Kingdom National Stem Cell Network*. York (UK) March 31, 2011.

124) Research design and preparing grant proposal in thoracic surgery. *6th National Thoracic Surgery Congress*. Antalya (Turkey) April 30, 2011.

125) Tracheal Transplantation. *6th National Thoracic Surgery Congress*. Antalya (Turkey) April 30, 2011.

126) Reprogramming cells for regenerative medicine. *Euroean Science Foundation Exploratory Workshop on Developmental Origins of Chronic Lung Disease*. Feldafing (Germany), May 1st, 2011.

127) Tissue engineered trachea for in vivo implantation. *American Thoracic Society International Conference*. Denver (USA), May 16, 2011.

128) Stem-cell based restoration and replacement therapies for irreversible diseases of the airway. *American Society Gene and Cell Theraly 14th Annual Meeting*. Seattle (USA), May 18, 2011.

129) Advances in airway surgery. *University of Vermount.* Burlington (USA) July 25, 2011.

130) Cell Therapy and Bioengineered Replacement of the Airways. *Stem Cells and Cell Therapies in Lung Biology and Lung Diseases.* Burlington (USA), July 27, 2011.

131) Trachea and oesophagus tissue engineering. *Fifth SENS Conference on Rejuvenation biotechnologies.* Cambridge (UK), September 2, 2011

Total amount of quotations in scientific publications in the past 10 years: 577

List of the ten most frequently-quoted articles

1. **Macchiarini P**, Fontanini G, Hardin M, Squartini F, Angeletti CA. Relation of neovascularization to metastasis in non-small cell lung cancer. *Lancet* 340:145-146, 1992. Times cited: 683

2. **Macchiarini P,** Jungebluth P, Go T, Asnaghi MA, Rees LE, Cogan TA, Dodson A, Martorell J, Bellini S, Parnigotto PP, Dickinson SC, Hollander AP, Mantero S, Conconi MT, Birchall MA. Clinical transplantation of a tissue-engineered airway. *Lancet* 372:2023-30, 2008. Times cited: 160

3. Marchetti A, Buttitta F, Merlo G, Diella F, Pellegrini S, Pepe S, **Macchiarini P**, Chella A, Angeletti CA, Callahan R, Bistocchi M, Squartini F. p53 alterations in non small cell lung cancers correlates with metastatic involvement of hilar and mediastinal lymph nodes. *Cancer Res* 53:2846-2851, 1993. Times cited: 132

4. Dartevelle P, Chapelier A, **Macchiarini P**, Lenot B, Cerrina J, Ladurie F, Parquin F, Lafont D. Anterior transcervical approach for radical resection of lung tumors invading the thoracic inlet. *J Thorac Cardiovasc Surg* 105:1025-1034, 1993. Times cited: 130

5. **Macchiarini P**, Fontanini G, Hardin M, Hsu C, Bigini D, Vignati S, Pingitore R, Angeletti CA. Blood vessel invasion by tumour cells predicts recurrence in completely resected T1N0M0 non-small cell lung cancer. *J Thorac Cardiovasc Surg* 106:80-89, 1993. Times cited: 92

6. Geneste O, Camus AM, Castegnaro M, Petruzzeli S, **Macchiarini P**, Angeletti CA, Giuntini C, Bartsch H. Comparison of pulmonary DNA adduct levels, measured by ^{32}P-postlabelling, and arly hydrocarbon hydroxylase activity in lung parenchyma of smokers and ex-smokers. *Carcinogenesis* 12: 1301-1305, 1991. Times cited: 89

7. **Macchiarini P**, Chella A, Ducci F, Rossi B, Testi C, Bevilacqua G, Angeletti CA. Neoadjuvant chemotherapy, surgery and post-operative radiotherapy for invasive thymoma. *Cancer* 68: 706-713, 1991. Times cited: 86

8. Dulmet E, **Macchiarini P**, Suc B, Verley JM. Germ cell tumors of the mediastinum. *Cancer* 72:1894-1901, 1993. Times cited: 74

9. Fontanini G, **Macchiarini P**, Pepe S, Ruggiero A, Hardin M, Bigini D, Vignati S, Pingitore R, Angeletti CA. The expression of proliferating cell nuclear antigen in paraffin sections of peripheral, node-negative non-small cell lung cancer. *Cancer* 70:1520-1527, 1992. Times cited: 70

10. **Macchiarini P**, Fontanini G, Dulmet E, Montpreville V, Chapelier A, Cerrina J, le Roy Ladurie F, Dartevelle P. Angiogenesis, an indicator of metastasis in non-small cell lung carcinomas involving the thoracic inlet. *Ann Thorac Surg* 57:1534-1539, 1994. Times cited: 62

Short summary of the findings in the 10 most important articles in the past ten years and the quotations of these articles.

1. Walles T, Giere B, Hofmann M, Schanz J, Hofmann F, Mertsching H, **Macchiarini P**. Experimental generation of a tissue-engineered functional and vascularized trachea. *J Thorac Cardiovasc Surg* 128:900-6, 2004. PMID: 15573075. IF 3.608; times cited: 28.
   The preclinical elements for a bioartificial airway were successfully engineered in vivo and in vitro in a direct vascularized 10- to 15-cm-long bioartificial xenogeneic matrix.

2. **Macchiarini P**, Walles T, Biancosino C, Mertsching H. First human transplantation of a bioengineered airway tissue. *J Thorac Cardiovasc Surg*128:638-41, 2004. PMID: 15457176. IF 3.608; times cited: 35.
   First clinical implantation of a tissue engineered airway tissue composed by a decellularized xenogeneic jejunal segment seeded with autologous muscle cells and fibroblasts

3. **Macchiarini P**. Primary tracheal tumours. *Lancet Oncol* 7:83-91, 2006. PMID: 16389188. IF 17.764; times cited: 15.
   This article describes the first staging system for malignant primary tracheal tumours.

4. **Macchiarini P,** Jungebluth P, Go T, Asnaghi MA, Rees LE, Cogan TA, Dodson A, Martorell J, Bellini S, Parnigotto PP, Dickinson SC, Hollander AP, Mantero S, Conconi MT, Birchall MA. Clinical transplantation of a tissue-engineered airway. *Lancet* 372:2023-30, 2008. PMID: 19022496. IF 33.633; times cited: 160.

   This reports the first in man tissue-engineered transplant of a compex organ, the windpipe: a patient affected by endstage post-tuberculousis malacia was transplanted using a six-centimeter decellularized cadaveric tracheal segment and the recipient's own stem and respiratory cells.

5. Asnaghi MA, Jungebluth P, Raimondi MT, Dickinson SC, Rees LE, Go T, Cogan TA, Dodson A, Parnigotto PP, Hollander AP, Birchall MA, Conconi MT, **Macchiarini P**, Mantero S. A double-chamber rotating bioreactor for the development of tissue-engineered hollow organs: From concept to clinical trial. *Biomaterials* 29:5260-9, 2009. PMID: 19647867. IF 7.882; times cited: 12.

   The development of a rotating double-chamber bioreactor permits the efficient repopulation of a decellularized human matrix, a concept that can be applied clinically, as demonstrated by the successful tracheal transplantation.

6. Jungebluth P, Go T, Asnaghi MA, Bellini S, Martorell J, Calore C, Urbani L, Ostertag H, Mantero S, Conconi MT, **Macchiarini P**. Structural and morphologic evaluation of a novel detergent-enzymatic tissue-engineered tracheal tubular matrix. *J Thorac Cardiovasc Surg* 138:586-93, 2009. PMID: 19698839. IF 3.608; times cited: 12.

   The preclinical work targeting the bioengineering of a non-immunogenic tracheal tubular matrix is reported. The grafts obtained displayed similar structural and mechanical characteristics to native tracheas and excite no immune response to 30 days when implanted as allografts or xenografts. This method was then used for the clinical tissue-engineered airway replacement.

7. Baiguera S, Jungebluth P, Burns A, Mavilia C, De Coppi P**, Macchiarini P**. Tissue engineered human tracheas for in vivo implantation. *Biomaterials* 31:8931-8938, 2010. PMID: 20800273. IF 7.882; times cited: 3.

   The article describes how to obtain a bioengineered human trachea that is structurally and mechanically similar to native trachea, and that retains chemotactive and pro-angiogenic properties.

8. Go T, Jungebluth P, Baiguera S, Asnaghi A, Martorell J, Ostertag H, Mantero S, Birchall M, Bader A**, Macchiarini P**. Both epithelial cells and mesenchymal stem cell-derived chondrocytes contribute to the survival of tissue-engineered airway transplants in pigs. *J Thorac Cardiovasc Surg* 139(2): 437-43, 2010. PMID: 19995663. IF 3.608; times cited: 6.

   We here demonstrated the necessity of both mesenchymal stem cell-chondrocytes and epithelial cells to obtain a functional and proper long-segment tracheal graft with clinical impact.

9. Jungebluth P, Luedde M, Ferrer E, Luedde T, Vucur M, Peinado VI, Go T, Schreiber C, Richthofen MV, Bader A, Haag J, Darsow KH, Bartel SJ, Lange HA, Furlani D, Steinhoff G**, Macchiarini P**. Mesenchymal stem cells restore lung function by recruiting resident and non-resident proteins. *Cell Transplant*. 2011. [Epub ahead of print]. PMID: 21396162. IF 6.204; times cited: 0.

   The results obtained provide the first evidence that mesenchymal stem cell therapy restores lung function in end-stage lung diseases via resident and not-resident homing protein-based effects.

10. Baiguera S, Gonfiotti A, Jaus M, Comin C, Paglierani M, Del Gaudio C, Bianco A, Ribatti D, **Macchiarini P**. Development of a bioengineered human larynx. *Biomaterials* 32(19):4433-42. 2011 PMID: 21474177. IF 7.882; times cited: 0.

    This articles describes the first tissue engineered obtainedment of human larynxes. Using a decellularization method, natural bioengineered laryngeal scaffolds for partial or total clinical implantation can now be obtained.

2 Scientific collaboration and external research grants

A total of 6.691.044 € have been raised by Prof. Paolo Macchiarini in the past five years in intarnational competition, of which 5.077.145 € as project leader and 1.163.899 € as joint applicant.

<u>As project leader in the past 5 years:</u> (total financial support 5.077.145 €):

1) Title: Generation of a tissue engineered trachea. Releasing authority: Fondo de Investigación Sanitario, Instituto de Salud Carlos III, Ministerio de Sanidad y Consumo, Spain. Period: 2005-2007. Total contribution: 126.735 €.

2) Title:Estudio de los factores patogenéticos de la estenosis traqueal benigna: Estudio en humanos y conejos. Releasing authority: Fundación Española de Neumología y Cirugía Torácica/SEPAR., Spain. Period: 2006-2007. Total contribution: 6.000 €.

3) Title: Feasibility Study of a novel vascular access mode for artificial lung. Releasing authority. Novalung GmbH, Freiburg. Period: 2006-2010. Total contribution: 110.000 €.

4) Title: Caracterización cellular y extracelular de la disfunción endotelial en la hipertensión pulmonar crónica post-embólica. Releasing authority: MAPFRE de Investigación. Period 2006-2010. Total contribution: 13.200 €.

5) Title: Feasibility Study of a novel treatment for postpneumonectomy ARDS. Releasing authority: Novalung GmbH, Freiburg. Period: 2006-2010. Total contribution: 45.000 €.

6) Title: Sistema de soporte respiratorio extracorpóreo sin bomba. Releasing authority: Agència d'Avaluació de Tecnología Mèdica, Ministerio de Sanidad/ISCIII. Spain. Period: 2007-2008. Total contribution: 282.910 €.

7) Title: Airway tissue engineering. Releasing authority: Ministry of Health, Tuscany. Period: 2010-2012. Total contribution: 500.000 €.

8) Title: BIOtrachea (No. 280584-2). Releasing authority: Biomaterials for Tracheal Replacement in Age-related Cancer via a Humanly Engineered Airway. FP7-NMP-2011-SMALL-5, European Project. Period: 2012-2017. Total contribution: 3,993,300 €.

As joint applicant in the past 5 years: (total financial support 1.613.899 €):

1) Title: Microfilm in tracheotomy patients. Releasing authority: Fondo de Investigación Sanitario/ Instituto de Salud Carlos III, Ministerio de Sanidad y Consumo, Spain, Period: 2005-2007. Total contribution: 55.000 €.

2) Title: Education, research and training in regenerative airway medicine. Releasing authority: Krasnodar Regional Association of Transplantology and Regenerative Medicine and Charity Foundation for Support of Scientific Researches "Science for Life Extension" (Russian Federation). Period: 2009-2012. Total contribution: 450.000 €.

3) Title: RegenVOX. Stem-cell based, tissue engineered laryngeal replacement. Releasing authority: Medical Research Grant on translational stem cell grant. Period: 2011-2013. Total Contribution: £954.829 or 1.108.899€ (based Exchange rate, 9 september 2011)

- National and international collaborative projects. The collaborative projects that Dr. Macchiarini has actually are listed in the following Table:

Regenerative Medicine

Tissue Engineering Replacements

Trachea (natural scaffolds)	Trachea (artificial scaffolds)	Lung Regeneration	Heart Regeneration	Esophagus
BIOtrachea Project (EU) University Yale (USA) Russia Academy Science (Russia) Harvard Bioscience (USA) Ola Hermanson Katarina Leblanc Evran Alici	European Union BIOtrachea Project (EU) Nanofiber Solutions (USA) Harvard Bioscience (USA) Vestfold University College (Norway) Katarina Leblanc Ola Hermanson Pontus Blomberg Bo Nilsson Evran Alici Staffan Strömblad	University Tulane (USA) University Vermount (USA) University Minnesota (USA) University Philadelphia (USA) University Aachen (D) Harvard Bioscience (USA) COST (European Cooperation in Science and Technology)	Harvard Bioscience (USA) University Minnesota (USA) Christer Sylver	Harvard Bioscience (USA) McGowan Institute for Regenerative Medicine University of Pittsburgh (USA)

Cell Therapy

Airway stem cancer cell	End-stage lung diseases
CERT (Florence, Italy) University College London (UK) McGowan Institute for Regenerative Medicine, University of Pittsburgh (USA) Harvard Medical School (USA)	University Aachen (D) University Siena (I) University Florence (I) University Tulane (USA) University Halle (D) Ana Teixara

Bioartficial Organs

Ambulung EU Project
Novalung GmBh (D) CERT (Florence, Italy) University Philadelphia (USA) Imperial College London (UK) Bo Nilsson Staffan Strömblad

Legend: International; National (Sweden)

3 Supervision of doctoral candidates/postgraduate education

Specify if you were that chief or joint supervisor!– if would also be intesting to learn how money years each person spent on their project. Also add info about if they have continued with their reseach after the exam.

- *Supervisor of Doctoral program:* For each candidate, indicate whether relationship has been as chief or joint supervisor, and which of these became research fellows (docent).

  Verhoye Jean-Philippe: *Tracheo-esophageal complications from mechanical ventilation.* *Université de Rennes I (Rennes, France)* 1998 (Chief Supervisor).

  Shukri, Tamara. Title: *Identification des antigènes responsable du rejet hyperaigue dans un modèle de xenotransplantation pulmonaire orthotopique cochon-chèvre.* *Université d'Angers (Angers, France)* 1998 (Chief Supervisor).

  Gruhn, Silke. Title: *Role der apnoische oxygenierung in der Trachealchirurgie.* Medizinische Hochschule Hannover (Germany), 2003 (Chief Supervisor).

  Karsten Kuhn. Title: *Evaluierung der transkardiopulmonalen Einzelindikator-Thermodilution nach Lungenresektionen wegen nichtkleinzelligem Bronchialkarzinom unter besonderer Berücksichtigung der Lymphadenektomie.* Medizinische Hochschule Hannover (Germany), 2005. (Chief Supervisor).

  Christian Biancosino. Title: *Generation of a bioartificial fibromuscular tissue with autoregenerative capacities for surgical reconstruction*. Medizinische Hochschule Hannover (Germany), 2006. (Chief Supervisor).

  Eike Nicke and Lars-Oliver Jasper. Title: *Perioperative Antibiotikaprophylaxe in der elektiven Lungenchirurgie: prospective Anwendungsbeobachtung mit "single-shot" Rocephin und retrospektive Kontrollanalyse zweier prolongierter Prophylaxe-Regime mit Augmentan und Unacid; klinische Wirksamkeit und Kosteneffizienz*. Medizinische Hochschule Hannover (Germany), 2008. (Chief Supervisor).

  Nina Städtler. Title: *Prospektive Analyse der Ösophagusfunktion nach Pneumonektomie*. Medizinische Hochschule Hannover (Germany), 2010. (Chief Supervisor).

  Philipp Jungebluth. Title: *A potential approach for tracheal reconstruction: biotissue engineering of a tracheal tubular graft*. Medizinische Hochschule Hannover (Germany), 2010. (Chief Supervisor). Dr. Jungebluth is actually Research Fellow at the Karolinska Institutet.

Leonardo Polizzi. Title: *Development of an animal model for bioengineered tracheal graft evaluation*. Faculty of Medicine at the University of Florence (Italy) (expected substainance, June 2012) (Chief Supervisor).

Johannes Haag. Title: *Improved biomechanics of tracheal natural scaffolds using cross-ling proteins.* Medizinische Hochschule Hannover (Germany). (Expected substainance: June 2012). (Chief Supervisor).

Jafar Jorjani. Title: *Interrelation between intensive care patients and general thoracic surgery.* Medizinische Hochschule Hannover (Germany). (Expected substainance: September 2012). (Chief Supervisor).

- <u>*Supervisor of postdoctoral program*</u>*:*
  Dr. Manoli Iglesias. Title: *Experimental and clinical extracorporeal mechanical ventilation in refractory acute distress respiratory syndrome*. University of Barcelona. (Expected sustenance: June 2012).

  Dr. David Sanchez. Title: *Pre-clinical efficacy of a novel extracorporeal ventilation device*. University of Barcelona. (Expected sustenance: June 2012).

  Dr. Alberto Rodriguez. Title: *Cellular and molecular endothelial dysfunction in chronic pulmonary embolism*. University of Barcelona. (Expected sustenance: June 2012).

  Dr. Jungebluth Philipp. Title: Regenerative approaches to end-stage diseases of the airways. (Medizinische Hochschule Hannover (Germany). (Expected substainance: June 2013).

  Sebastian Sjöqvist. Title: Tissue engineering and stem cell therapy for esophageal disorders. Clinical Scientist Training Programme (CSTP) Karolinska Institutet. Period: 2011-2014.

- **Work as lecturer and planner of postgraduate courses.**
  Lecturer (listed in inverse chronological order).
  Lecturer for medical students and clinical and research fellows instruction, Karolinska Institutet, Stockholm (Sweden). (Since 11/2010)

  Lecturer, principles of tissue engineering and cell therapy of respiratory diseases. Master of regenerative medicine, University of Modena, Italy. (Since 2010)

  Lecturer in reconstructive surgery of the airway and Principles of regenerative medicine. Post-graduate course in General Thoracic Surgery, Faculty of Medicine, University of Florence (Italy). (Since 10/2010)

Lecturer in principles of airway surgery and surgical techniques in general thoracic surgery and Principles of regenerative medicine. EU Master in Respiratory Medicine. University of Barcelona, Barcelona (Spain) (04/2008 –12/2010)

Lecturer in Lung and Heart lung transplantation and tissue engineered replacements of intrathoracic organs and complex tissues. Master in Organ Transplantation. University of Barcelona, Barcelona (Spain) 02/2007-12/2009

Lectures in Thoracic Trauma and extracorporeal lung support. Master Intensive Care Unit. University of Barcelona (Spain). (03/2005/12/2009)

Lectures in General Thoracic Surgery and Lung and Heart-lung Transplantation. Post-graduate course in General Thoracic Surgery. Faculty of Medicine, Paris-Sud University (France) (12/1993-04/1999)

Lectures to student first and second level, Faculty of Medicine, University of Pisa (Italy) (1/1988-12/1992)

Planner of Postgraduate Course (listed in inverse chronological order).
Director, Post-graduate Program of General Thoracic Surgery, Hospital Clínic, University of Barcelona (Spain) (03/2005-12/2009) (*http://www.separ.es/separ-mir/programa_formacion.html)*

Director of the Airway Surgical Program, and Lecturer at the European School of Cardio-thoracic Surgery, Bergamo (Italy). (01/2003- 12/2007).

Director, Post-graduate Program of General Thoracic Surgery, Hannover Medical School, (Germany) 04/2000-12/2004 *(http://www.aekn.de)*

General Thoracic Surgery Post-graduate Course, Annual meeting of the European Association of Cardio-thoracic Surgery, Monaco (Montecarlo), September 22, 2002.

- **Development work within postgraduate studies (add few words).**

In the below listed academic Institutions, Dr. Macchiarini has been the main responsible for the theoretical and practical education of the related clinical and/or reseach domains, and for structure and organization of the main courses.

Director, European Center Thoracic Research (CERT), University Hospital Careggi, Florence (Italy) (Since 06/2011) (http://web.rete.toscana.it/attinew)

Director, Post-graduate Program of General Thoracic Surgery, Hospital Clínic, University of Barcelona (Spain) (03/2005-12/2009) (*http://www.separ.es/separ-mir/programa_formacion.html)*

Director, Post-graduate Program of General Thoracic Surgery, Hannover Medical School, (Germany) (04/2000-12/2004) *(http://www.aekn.de)*

4 Evaluation of others' work

Document duties as

- Appointments as an expert for the judgement of applications for academic positions.
  - Mr. Tobias Welte: Hannover Medical School (Germany). 2003: Appointment as C4 (Full Professorship) Professor
  - Mr. Jean Philippe Verrohye: Rennes University (France). 2007: Apppointment to PHU (Professuer Universitaire Hospitalier).
  - Mr. Martin Birchall: University College London (Germany). 2009: Appointment as Full Professor of Laryngology
  - Mr. Bader: Belfast University (Ireland). 2010: Appointment as Chair of Regenerative Medicine and Professor of Regenerative Medicine.
  - Mr. Fabrizio Follis: University of New Mexico (USA). 2010: Appointment as Chair of Cardiac Surgery and Full Professor of Cardiac Surgery.
  - Mr. Daniel Weiss: University of Vermount (USA). 2011: Appointment as Full Professor.

- Participation in Boards of International scientific evaluation committees.
  - Chairman, Research and Research Funding, European Association Cardio-thoracic Surgery (EACTS)
  - Scientific Council on Pulmonary Transplantation, International Society of Heart-Lung Transplantation
  - European Union Liaison, EACTS
  - Post-graduate Education, EACTS
  - Young Investigator Awards, EACTS
  - Surgical Treatment of End-Stage, Cardiopulmonary Disease Committe, Society of Thoracic Surgeons, Society of Thoracic Surgery

- Referee duties for research applications at an international level.
  - DFG (Deutsche Forschungsgemeinschaft, Germany). Domain: Organ and Tissue Transplantation (2002-2006)
  - Wellcome Trust (UK). Domain: Regenerative Medicine (2008-present)
  - Italian Association for Research in Cancer (Italy). Domain: Experimental cancer research (2007-2008)
  - EMEA (European Medical Agency). Domain: Stem cell and tissue engineering for end-stage lung diseases (since 2009)
  - EU evaluator FP7 (EU, Brussels). Domain: Regenerative medicine and organ transplantation (2010-2013)

- Referee duties for research applications at a national level.
    - None in Sweden;
    - Fondo de Investigación Sanitario, Instituto de Salud Carlos III, Ministerio de Sanidad y Consumo, Spain (2006-2010)
- Work as an external opponent. Document thesis title and university.
    - Jean Philippe Verrohye. Title: Surgical management of tracheal diseases. Rennes University (France). 1997
- Member of the evaluation committee for PhD theses.
    - In all of my listed PhD students
- Editor of scientific journals. Document time period and journal.

  Dr. Macchiarini has never been acting as Editor but has been elected in the editorial board of these journals:
    - Journal of Heart-Lung Transplantation (1990-1993)
    - Vascular and Myocardial Regeneration (1993-1996)
    - Surgical Technology Interventional (1998-1996)
    - Transplant International (1998-2000)
    - International Journal for Cancer Research and Treatment (2005-2010)
    - Lancet Oncology (2004-2007)
    - Stem Cell Research and Treatment (since 2010)
    - Stem Cells Translation Medicine (since 2010)

- Referee for scientific journals. Document number of duties and journals.

  The journal listed below are those were Dr. Macchiarini reviewed more than 3 papers/year:

    - Cancer
    - Annals Of Thoracic Surgery
    - British Journal Of Cancer
    - European Journal Of Cardio-Thoracic Surgery
    - Annals of Surgical Oncology
    - Journal of Thoracic and Cardiovascular Surgery
    - Transplantation
    - Biomaterials
    - Lancet
    - Lancet Oncology
    - American Journal of Transplantation
    - Cancer Letters
    - Experimental Biology and Medicine
    - Cytotherapy
    - Journal of Healthcare Engineering
    - Critical Care Medicine
    - Tissue engineering
    - Current Pharmaceutical Design
    - Expert Opinion On Biological Therapy
    - Expert Review of Respiratory Medicine
    - Stem Cell Translational Medicine

5 Future research plans

The research programme of Dr. Macchiarini involves mainly but not exclusively translational and reverse translational regenerative medicine approaches for diseases of the respiratory system (larynx, trachea and lungs), and the performance of clinical trials on tissue engineering replacements of the airway. A summary description is present below while the clinical implications and a time scale with milestones to reach at the end of this paragraph.

Overview

The research programme of Dr. Macchiarini encommpasses, but is not restricted to, regenerative approaches, including both tissue-engineered replacement and stem cell-based therapy, of otherwise untreatable end-stage benign and malignant diseases of the respiratory tract and system. We already replaced the entire windpipe (trachea) and main stem bronchus with completely tissue engineered non-immunogenic human tracheas (using a natural decellularized matrix, autologous epithelial and mesenchymal stem cells) in 9 patients with end-stage benign (1-3) and malignant (4) diseases. These initial case studies have been positively evaluated by the Italian National Health Authority and a full Clinial Trial Authorization (CTA) has been obtained to provide definitive data supporting tissue engineered tracheal replacement using natural scaffolds as a standard operating procedure (SOP). We also provided definitive preclinical evidence that stem cell transplantation significantly improves end-stage pulmonary vascular diseases (5). This methodology, whilst demonstrating essential proof of concept, has the potential to treat thousands a year of children and adults with end-stage respiratory (larynx, lungs) and upper digestive (pharynx, esophagus) diseases.

However, and despite these recent advances, we are far behind from understanding the underlying mechanisms and processes and translating them into routine clinical practice. The future research plans are therefore aimed to improve and optimize the tissue engineered technique for trachea replacement, extend it to the larynx, bronchi and lungs, use bioartificial nanocomposite scaffolds to replace the airway, and investigate the repair and restoration, at the cellular level, of the above mentioned organs. Our ongoing preclinical strategies to mobilize autologous progenitor cells, increase their integration into the damaged tissues, activate resident stem cells, stimulate tissue regeneration and *in situ* angiogenesis *via* specific growth, differentiating and boosting factors will also be optimized and is already in the process of being transferred to the clinical settings.

Background:

Tissue engineered replacement: An efficient and rapidy vascularisation is essential to prevent *in vivo* necrosis of tissue engineered airway scaffolds, especially for long-segment replacements. To increase construct vascularisation, we recruited and mobilized resident and non-resident progenitors and stem cells, using a peritransplant pharmacologically induced ‘boosting’ regenerative therapy (6). While we have demonstrated proof of concept of the potential benefit of ‘boosting’, we now need to understand the exact effects of these factors. The impact of specific boosting factors on tissue

engineered tracheal and laryngeal constructs will therefore be evaluated, both *in vitro* and *in vivo*, to selectively activate stem cells, and improve cellular differentiation and angiogenesis in order to accelerate the healing of a tissue engineered airway. Furthermore, a limitation of our current technology is the time it takes to differentiate sufficient cells to re-populate the epithelium of the implanted decellularized trachea. In our case studies, tracheal replacement patients were observed to be slow to develop functional clearance of secretions, probably because our first generation of replacement airways lacked the normal airway epithelial lining which contains cilia and secretory cells that lubricate and transport inhaled debris and thick secretions for clearance. A suitable strategy to obtain an *in vitro* rapid expansion and differentiation of airway progenitor cells is to generate *in vitro* epithelial sheets that will facilitate the rapid epithelialisation of a transplanted scaffold which will therefore be investigated and obtained. One major drawback of the tissue-engineered approach developed for airway replacement is based on human donor airways. To provide a functional solution for airway regeneration without depending on the availability of cadaveric complex tissues, a novel patient-tailored artificial airway scaffold has been investigated preclinically and its first clinical implantation in humans performed in June 2011.

Stem cell-based therapy: Respiratory diseases such as pulmonary hypertension (PH), chronic obstructive pulmonary disease (COPD), and lung cancer might initiate and/or be promoted *via* similar pathological mechanisms. Based on the idea that the inflammatory process is likely to have a crucial role in-between these pathologies, the presence of inflammatory signals (7,8) will be investigated both in healthy and diseased samples. In addition, the cross-talking signals (9), downstream pathways and neo-angiogenesis will be evaluated. After understanding the significance of particular pathways for the development and promotion of the mentioned diseases, we will focus on specific potential therapeutic targets. Given MSCs demonstrated their immunomodulatory abilities, the interactions on how these cells impact and manipulate inflammatory signals and the immune response of the organism will be investigated. Moreover, the self-healing potential of the body and how to stimulate it, *via* boosting factors and their effects onlocal progenitor cells will be evaluated *in vitro* as well *in vivo*.

Research plan

The past preclinical and clinical regenerative experiences will be used to improve the following translational and reverse translational research fields:

A) Tissue engineering

The airway, natural scaffolds: Improve our already clinically applied method of tissue engineered tracheal replacement and extend the acquired knowledge to the lungs, heart and laryngeal replacements. The methodologies developed and used for previous clinical cases will be explored in order to validate the scaffold production processes, selection of cells and bioreactor design to generate standardised protocols that can be used as standard operating procedures (SOPs) for clinical trials and for commercialisation processes. Moreover, in order to develop a manageable animal model, such as a rat model, to further investigate the process of tissue-engineered airway *in vivo* regeneration, the decellularization process of rat tracheas and larynges will be

investigated by histological, morphological and mechanical analysis and in *vitro* and in *vivo* pro-angiogenic properties evaluated. The *in situ* regeneration of tissue-engineered airway will then be evaluated by using *in vitro* and *in vivo* assays with respect to angiogenesis and epithelialization. Bone marrow mononuclear progenitor cells (MNCs) will be used to seed the matrices by direct injection of cells into decellularized or synthetic scaffolds. Cell migration, differentiation, protein (in particular pro-angiogenic) expression and matrix organisation will be monitored (via life-imaging). The impact of specific boosting factors (*e.g.,* Granulocyte Colony-Stimulating Factor, Erythropoietin, TGF-beta, VEGF-A, AMD3100, IL1-6) on tissue engineered tracheal and laryngeal constructs will therefore be studied *in vitro* on MNC cultures (cell survival, proliferation, differentiation and angiogenic potential) and in recellularized tissue engineered tracheal and laryngeal constructs (cell migration, differentiation and protein expression). Moreover, using a murine model of heterotopic airway transplant, the effectiveness of G-CSF/Erythropoietin treatments alone or in combination on the rate and extent of tissue regeneration will be assessed. Cells will be analyzed with multi-parameter flow cytometry for expression of a variety of markers for characterization of different cell types and cellular migration potential such as chemokine receptors as well as phenotype of MSCs, EPCs and HSCs. Besides, we will analyze systemic effect of progenitor mobilization using multiplex arrays to detect for a wide range of chemoreceptors. chemokines and growth factors. Mobilized cells will also be evaluated epigenetically to detect specific profile showing their activation/homing etc. (initial findings were obtained in the recently performed clinical transplantation of a stem cell seeded artificial graft). Tumorigenesis will be carefully investigated.

The airway, artificial scaffolds: The primary goal of this research is to obtain a synthetic airway scaffold with the structural and biomechanical properties of the natural airways. Recently we performed the world´s first-in-man transplantation of a stem cell seeded synthetic scaffold. However, the material must be optimized to improve epithelial development and thus improve post-operative mucus transportation. Therefore different artificial materials such as a nanocomposite polymers (already successfully applied in the development of cardiovascular biomaterials and medical devices) or nanofibers matching natural biomechanical properties will be developed and evaluated (10,11). Synthetic materials can be individually tailored, avoid organ donors and can be sterilized. To enhance the cell engraftment and differentiation we will investigate how to modify and optimize the synthetic material, namely coating with various detergent. Starting from these preliminary studies, airway synthetic scaffolds will be manufactured using micro- and nanofibres spiral reinforcement made from the same biomaterial. In addition, various peptides will be investigated for surface modification and attachment on to the scaffold surface to enhance stem cell adhesion and differentiation. Bespoke patient-specific scaffolds will be produced from computed tomographic (CT) scans, via computer-aided design and optimum porosity and cell density will be determined. The scaffold will be seeded *in vitro* and the resultant constructs monitored in the bioreactor. The performance of novel synthetic bioengineered scaffolds will be validated by comparison with decellularized biological scaffold materials. Considering that *i)* non-human primates (NHP) have phylogenetic similarities with humans, *ii)* that similarities between NHP and

human regarding cell surface markers and immunological responses have been demonstrated, and that *iii)* ACTREG has the possibility to use the primate centre of Karolinska Institutet, the *in vivo* analysis will be performed on NHP (Rhesus macaques, *Macaca mulatta*).

Other intrathoracic organs. The aims are to *a)* obtain both lung and heart scaffold by using a recently developed bioreactor (Harvard Apparatus) for both organs. The bioreactor allows for separate decellularization and recellularization under sterile conditions. Our clinically applied method of decellularization will be transferred to the mentioned organs. Likewise different protocols will be evaluated and criteria of optimum scaffold formlated. Engineered scaffolds will be investigated for proteomic profile and role of remaining proteins will be investigated. Different cell types (autologous and allogenic differentiated and undifferentiated cells) will be used, such as MSCs, iPSCs, fetal lung cells, epithelial cells, Islet cells, etc. Cell binding, engraftment and differentiation will be studied within the different tissues and culture conditions. The possibility of influencing and improving cell differentiation will be studied by miRNA analysis and potential application during culture. Beside the decellularization of healthy organs we aim to decellularize diseased tissue, such as fibrotic lungs. This will help to investigate the possibility of re-use of an otherwise unusable organ. *b)* the aortic root is of very high interest since the number of patients suffering from aortic valve disease is large *c)* Regarding the esophagus we plan to study different techniques such as cell sheet engineering and decellularized scaffolds. Both will be evaluated in animal models and, if successful, transferred to the clinic.

Epithelial tissue engineering: Different epithelial sources (nasal, laryngeal, tracheo-bronchial cells) will be evaluated to determine if cell origins can influence *in vitro* expansion and differentiation potential and if cells can be expanded to cover a scaffold pre implantation. Growth, differentiation and ciliated cell beat frequency will be evaluated. Epithelial biopsies and cells will be used to seed the inner surface of matrices. Cell migration, protein regulation involved in epithelial tissue engineering, epithelium microstructure and epithelial layer functionality will be evaluated. Recently the crucial role of mi-RNAs of the miR-34/449 family for the differentiation of stem cells into bronchial ciliated cells has been described in a mouse model. We could show their influences for this particular issue for the first time in man. Further studies will be performed to elucidate their real meaning for stem cell differentiation and how to use the potential to guide and enhance the development of epithelial cells. Obtained findings will be transferred to our lung tissue engineering study and potentially applied in clinic. Together with one of our collaboration partners (Novalung, Hechingen, Germany) we will investigate the possibility to seed and cover artificial membranes with endothelial progentiros cells and pneumocytes for clinical implantation and/or ambulatory application for improved gas exchange. Several questions need to be answered such as cell attachment, differentiation, which cell type to use, immunological response, functionality and survival. Studies will be monitored by life-imaging and confocal microscopy. Cells can be labeled via GFP-expressing virus. *In vitro* and *in vivo* (large animal) studies needs to be performed.

B) ***Cell Therapy for Airway diseases***

To investigate the pathological mechanisms involved in the development of lung parenchymal and vascular diseases (such as PH, COPD and lung cancer). Common pathophysiological mechanism of PH, COPD and lung cancer will be evaluated in different animal models: for PH, we will use our recently published small animal model of rats (5), while for COPD and lung cancer an animal model of chronic inflammation induced by tobacco smoke will be used. Genetically modified animals (Cre-activatable K-rasG12D allele (*K-rasLox-STOP-Lox (LSL)-G12D/WT*) and a conditional loss-of-function p53 allele (*p53Flox/Flox*) will allow proteinomic evaluations. Respiratory tract organs will be evaluated on cellular and protein levels both in healthy and in diseased conditions to detect for common overlapping mechanisms *via* histology, immunhistochemistry, electron microscopy and proteomics. Based on the presumption that chronic inflammatory stimuli might initiate and promote lung cancer in damaged lung tissue, underlying inflammatory mechanisms, such as Notch signaling and NF-kappaB and, their downstream pathways will be elucidated. Moreover, to evaluate inflammatory response on external stimulus and/or endogenous modification (genetically modified), lung tissue will be investigated for IL-1-beta, IL-6, TNF-alpha Mip 1 alpha and Mcp 1 with ELISA assay. Both in the healthy native and in the diseased lung we propose to detect and isolate putative lung epithelial progenitor potential (such as CC10+, K5/K14+, CGRP+, SPC+ and CC10/SPC+ and C-Kit pos. cells) and thus synonymic with niche cells. Besides, the potential of up- and downregulating these cells will be one target challenge. Moreover, we aim to characterize cancer cells (isolated from patients with lung or trachea cancer) and investigate for so-called cancer stem cells. Different genetic analyses will be performed.

Performed proof of concept. We developed the preclinical data of tracheal tissue engineering starting with basic *in vitro* studies to understand native structural architecture, mechanical, histochemical properties, and immuno-competence. Optimum culture conditions were obtained and a specific-bioreactor designed. The complete cell biology was evaluated and both differentiated and stem cells were studied and all was also applied in small and large animals. These preclinical data were required for the provision of a Clinical Trial Authorization (CTA) and then a First-in-Man Trial (FIMT) using natural scaffolds to replace benign and malignant diseased trachea. The decellularization method, pharmacological strategy to boost regeneration, use mononuclear cells, clinical indications and surgical techniques have been strictly defined, providing definitive guidelines for a tissue engineered airway replacement. This authorization was obtained in different countries including Spain, Italy, Uk, and Russia. Based on these criteria, the EU has recently supported a comparative clinical study (using natural and synthetic tracheal scaffolds) to introduce at an European level the clinical paradigm of tracheal tissue engineered replacements, and evaluate long-term outcome and maximum effective life-time as a platform for safety, efficacy, good clinical practices, commercialisation and delivery of innovative biomaterial products for tissue engineering applications.

However, we are continuously improving and adapting the already applied methods for optimum clinical outcome due to the reverse translational research that reflects our initial clinical findings. Addressing each of the issues proposed

will help to bring forward clinical therapeutic concepts of regenerative medicine and will move us beyond state-of-the-art by allowing us to scale-up our existing technique from one that can be used for individual patients to one that can be rolled out to a large population of patients in a simple, reproducible and routine technique, commercially effective and in a socially acceptable way.

Related references: 1. Macchiarini P et al. (2008). *Lancet* 372:2023–2030. 2. Laurence J. *BMJ* 2010;340,c1633. 3.News BBC. June 2010 Available from URL: http://news.bbc.co.uk/2/hi/8576493.stm. 4. News ABC. Online from August 2010. (http://abcnews.go.com/Health); August 2010. 5. Jungebluth P et al. (2011). *Cell Transplantation (in press)*. 6. Kalathur M et al. (2010). *Cell Mol Life Sci* 67:4185-96. 7. Luedde T et al. (2006). *J Gastroenterol Hepatol* 3:S43-6. 8. Bettermann K et al. (2010). *Cancer Cell* 17:481-96. 9. Poellinger L et al. (2008). *Curr Opin Genet Dev* 18:449-54. 10. Kannan RY et al. (2007) *Plast Reconstr Surg* 119: 1653-1662. 11. Raghunath J et al. (2009) *Biotechnol Appl Biochem* 2009; 52: 1-8.

Projects & Milestones

2011	2012	2013	2014	2015
Trachea				
Synthetic:				
World´s first synthetic trachea transplantation (09.06.2011) *				
Invited Manuscript for NEJM (submitting date 06.09.2011)**				
Natural:				
Milestone: Clinical Study***				
Larynx				
Milestone: First human application****				

NB:
- Following trachea related studies currently running: mi-RNA analysis, cell characterization (FACS), Multiplex (cytokines, chemokines, growth factors), imaging, epigenetics, gene analysis

** Improvements, modification of the concept, next transplantation expected for autumn 2011

*** Already in patients (n=9) applied (Lancet 2008). Currently running: evaluation and improvements, proteomics, pharmaceutical intervention, small animal models, fully automatisation of decellularization and cell seeding

**** Standardize Organoid Decellularization (done); Transfer of tracheal engineering method to larynx, ex vivo Seeding, Functional test, neural innervation, animal models

2012	2013	2014	2015	2016
Lung & Heart				
Milestone: First non-human primate transplantation *				
Esophagus				
Milestone: First large animal implantation **				
Cancer stem cells				
Milestone: identification and characterization of cancer stem cells***				

NB:
- Standardize Organoid Decellularization (*in vitro* and animal studies); *Ex vivo* Seeding, Functional test, epithelialization

** Transfer our tissue engineering method to the esophagus, large *in vitro* studies

*** Currently analyzing human samples, planned animal studies – planned: Implication for tumor genesis and progression (genetic modified animal models)

2012	2013	2014	2015	2016
Lung diseases				
Milestone: Pulmonary hypertension - transfer to the clinic*				
Milestone: COPD - transfer to the clinic**				
AmbuLung (Bioartificial Lung				
Milestone: Clinical application*** within 2014				

NB:
* Pulmonary hypertension: small animal model, intratrachea stem cell treatment, techniques to improve cell efficiency, cell tracking

** COPD: establishing an animal model, therapeutical approach *via* stem cell administration, describe pathological findings and potential improvements after cell therapy

*** Artificial membrane seeded with epithelial cells able to provide clinical relevant gas exchange; in vitro studies and large animal models

6 Collaboration with the community

This section covers collaboration with the community based on the researcher's scientific work.

- Industries:
  - Harvard Bioscience (www.harvardbioscience.com, USA)
  - Nanofibers Solution (www.nanofibersolutions.com, USA)
  - Novalung GmbH (www.novalung.com, Germany)

- Own patent: Synthetic scaffolds and airway transplantations (US serial number 61/505,096)

- Authorities:
  - EU evaluator FP7 Projects (EU, Brussels)
  - Vatican Scientific Foundation (Vatican)
  - ASPEN Institute Italia (Milan, Italy)
  - EMEA (European Medical Agency, London, UK)
  - Ethiopia (Heart for Ethiopia Humanitary Porgramme)
  - Russian Health Ministry

- Patient associations or similar
  - Red Cross
  - Emergency
  - www.stemcellpioneers.com
  - Change a Life – Regenerate a Life

- Media:
  - Documentary about Stem cells organ transplantation by James Cameron, producer of Avatar
  - The Times. Claudia Castillo gets windpipe tailor-made from her own stem cells. http://www.timesonline.co.uk/tol/life_and_style/health/article5183686.ece 19November, 2008
  - BBC. Windpipe transplant breakthrough. http://news.bbc.co.uk/2/hi/7735696.stm 19 Nov 2008
  - The Guardian. Transplant first a giant leap for surgery. http://www.guardian.co.uk/society/2008/nov/19/stem-cell-transplant-claudio-castillo 19 Nov 2008
  - The Daily Star. First trachea transplant without drugs. http://www.thedailystar.net/newDesign/news-details.php?nid=64345 22 Nov 2008
  - The Times. New model humans. The transplant of a windpipe built from stem cells shows we are entering a new era of sci-fi medicine. http://www.timesonline.co.uk/tol/news/science/article5213509.ece 23 Nov 2008
  - The Guardian. Boy's windpipe replaced in pioneering stem cell operation. http://www.guardian.co.uk/science/2010/mar/19/boy-windpipe-replaced-stem-cells 19 March 2010

- The Times. 'Milestone moment' as boy undergoes transplant to regenerate trachea. http://www.timesonline.co.uk/tol/news/uk/health/article7068514.ece 20 March 2010
- The Washington Times. Doctors: Transplant advance in windpipe cancer http://www.washingtontimes.com/news/2010/jul/30/doctors-transplant-advance-in-windpipe-cancer/ 30July 2010
- Abc News. Stem Cell-Engineered Windpipe for Cancer Patients http://abcnews.go.com/Health/Health/successful-stem-cell-trachea-transplant/story?id=11308383 2 Aug 2010
- Singolarity Hub. Woman Speaks With Her Own Voice After Larynx Transplant http://singularityhub.com/2011/01/22/woman-speaks-with-her-own-voice-after-larynx-transplant-video/ 22 Jan 2011
- The Washington Times. Sweden hospital in lab-made windpipe transplant. http://www.washingtontimes.com/news/2011/jul/7/sweden-hospital-in-lab-made-windpipe-transplant/ 7 Jul 2011
- The Washington Times. Doctors use lab-made windpipe in transplant. http://www.washingtontimes.com/news/2011/jul/7/doctors-use-lab-made-windpipe-in-transplant/ 7 Jul 2011
- BBC. Surgeons carry out first synthetic windpipe transplant. http://www.bbc.co.uk/news/health-14047670 7 July 2011
- CBC News. Windpipe transplanted from man's own stem cells. http://www.cbc.ca/news/story/2011/07/07/windpipe-transplant-stem-cell.html 7 Jul 2011
- CNN. Lab-Made Organ Implanted For First Time http://www.thedenverchannel.com/health/28476214/detail.html 7 Jul 2011
- USA Today. Lab-grown windpipe saves cancer patient http://www.usatoday.com/NEWS/usaedition/2011-07-08-windpipe_ST_U.htm 7 Jul 2011
- abcNews. Sweden Hospital in Lab-Made Windpipe Transplant. http://abcnews.go.com/Health/wireStory?id=14020120 7 Jul 2011
- BBC News. First synthetic organ transplant. http://www.bbc.co.uk/news/health-14068012 7 Jul 2011
- NPR.org. Cancer Patient Gets First Totally Artificial Windpipe. http://www.npr.org/blogs/health/2011/07/20/137701848/cancer-patient-gets-first-totally-artificial-windpipe 8 Jul 2011
- LifeNews.com. Adult Stem Cells Help Create New Windpipe, Save Cancer Patient http://www.lifenews.com/2011/07/08/adult-stem-cells-help-create-new-windpipe-save-cancer-patient/ 8 Jul 2011
- The Wall Street Journal. Lab-Made Trachea Saves Man http://online.wsj.com/article/SB10001424052702304793504576432093996469056.html?KEYWORDS=macchiarini 8 Jul 2011
- Business&Health Cancer patient saved by first-ever synthetic organ transplant. http://www.ibtimes.com/articles/176700/20110708/transplant-windpipe-karolinska-sweden-surgeons-cancer-stockholm-organ-trachea.htm 8 Jul 2011

- BdNews. First synthetic organ transplant in Sweden. http://bdnews24.com/details.php?id=200341&cid=2 8 Jul 2011
- The Times Tribune. Lab-made windpipe used in transplant. http://thetimes-tribune.com/news/health-science/lab-made-windpipe-used-in-transplant-1.1172904?localLinksEnabled=false#axzz1VkRKpoCs 9 Jul 2011
- The Hindu. Hospital in Sweden performs lab-made windpipe transplant http://www.thehindu.com/news/international/article2211776.ece 9 Jul 2011
- The Telegraph. First transplant of a fully synthetic organ carried out. http://www.telegraph.co.uk/health/healthnews/8624053/First-transplant-of-a-fully-synthetic-organ-carried-out.html 22 August 2011
- The Telegraph. British doctors help perform world's first transplant of a whole organ grown in lab. http://www.telegraph.co.uk/health/healthnews/3479613/British-doctors-help-perform-worlds-first-transplant-of-a-whole-organ-grown-in-lab.html 22 August 2011

KAROLINSKA INSTITUTET
TEACHING PORTFOLIO

Approved by the Board of Research, February 4th 2010

AIMS

Chapter 3, section 2 of the Higher Education Act provides that "[o]nly a person who has shown academic or teaching skill may be appointed professor". This applies to (senior) lecturers (Higher Education Act chapter 3, section 5) and (junior) lecturers (Higher Education Ordinance chapter 4, section 9). Chapter 4, section 5 of the Higher Education Ordinance also states that "[a]s much attention shall be given to the assessment of teaching skills as to the assessment of academic skills". The overall goal of the teaching portfolio is to supply the information needed to assess the scope and quality of a teacher's educational achievements and to provide employees at Karolinska Institutet with a structure for documenting their teaching qualifications.

The assessment of teaching skills focuses on the quality of the work that the assessee has done, essentially the extent to which he or she has helped to encourage and promote learning. Information only about *what* the teacher has done is insufficient; an assessment must also take into account *how* a teacher has worked, *why* he or she has done so in this particular way, and the *results* that have been achieved. The assessee's own commentary and thoughts on the work he or she has done is an important source of information for assessing such qualitative aspects.

The portfolio may not exceed ten sides of A4, which means that teachers are to summarise their experience and give only a selection of examples.

CONTENTS

1. Summary of educational practice
2. Development of educational knowledge
3. Examples of teaching, supervision or examination development
4. Contributions to educational development
5. Other qualifications
6. Thoughts about your own professional practice

1 Summary of educational experience

1.1 Teaching of students

a. Length of time

- State the courses and programmes on which you have taught.
  - Faculty of Medicine, University of Pisa, Italy (1988-1992):
    Bachelor level:
    - Weekly bedside classes for medical students and clinical education
    - Lung and bronchial surgery procedures

    Doctoral Level:
    - Lung and bronchial surgery procedures (Pneumology fellows)
    - Lung and bronchial surgery procedures (General surgical fellows)
    - Lung and bronchial surgery procedures (Emergency surgical fellows)
  - Institut Marie et Curie, Sorbonne University, Paris, France (1992):
    Doctoral level: Angiogenesis and solid malignancies
  - Faculty of Medicine, Paris-Sud University Paris, France (1993-1996)
    Bachelor level:
    - Weekly bedside classes for medical students and clinical education

    Doctoral Level:
    - Lung and Surgery of the malignant thyroid cancer
    - Surgical procedures of Pancoast-tumors
  - University Franche-Compte, Beçanson, France (1996-1999)
    Master in Organ and Tissue Transplantation
    - Heart-lung-transplantation (1996-1999)
    - Principles and immunology of xenotransplantation (1998-1999)
  - Medizinische Hochschule Hannover, Hannover, Germany (2001-12/2004)
    Bachelor level: Weekly bedside classes for medical students and clinical education

    Doctoral Level:
    - Principles of general thoracic surgery
    - Principles of esophageal and mediastinal surgery
    - Principles of lung cancer (staging and surgical therapy)
    - Director, Post-graduate (Residents and Fellows) program of general thoracic surgery *(http://www.aekn.de)*
  - University of Barcelona, Barcelona, Spain (2005-2010)
    - Director, Post-graduate (Residents and Fellows) program of general thoracic surgery (http://www.separ.es/separ-mir/programa_formacion.html)
    - EU Master in Respiratory Medicine. Lectures in principles of airway surgery and surgical techniques in general thoracic surgery and Principles of regenerative medicine.
    - Master in Organ Transplantation. Lectures in Lung and Heart lung transplantation and tissue engineered replacements of intrathoracic organs and complex tissues.
    - Master Intensive Care Unit. Lectures in Thoracic Trauma.

- Faculty of Medicine, University of Florence (Italy). (Since 10/2010)
  Doctoral Level:
  - Lecturer in Reconstructive surgery of the airway (4th year)
  - Principles of regenerative medicine (5th year).
- European Post-graduate School of Cardiothoracic Surgery, Bergamo (Italy). (01/2003- 12/2007).
  - Director of the Airway Surgical Program
- University of Modena, Italy (since 2011)
  Doctoral Level:
  - Lecturer, principles of tissue engineering and cell therapy of respiratory diseases. Master regenerative medicine (Since 2010)

- Teaching experience can be given in terms of years and per cent of full time. *Dr. Macchiarini's teaching experience has started 22 years ago and includes 45% percent of his full time.*
- Teaching time includes planning, contact and marking etc.
  Educational and academics priorities and responsibilities has always been one of my major concerns. Educational priorities have always targeted to the appeal to medical students early and to re-emphasize the importance of mentorship. Academic responsibilities have always maximally improve the quality of clinical research, re-emphasize basic science research commitment, reinvest in surgical research, and recognize resident interest in academics. My philosophy has always been that by mentoring and performing state-of-the art education, one could expect that new medical forces will be accrued on a neutral financial basis through the clinical and, especially, experimental environment. Therefore, my teaching activity has:
  - been particularly focused on the clinical teaching of surgical (first and second level) residents, fellows and junior staff;
  - included the organization/establishment of research laboratories and clinical departments in several EU countries and academic institutions;
  - included the creation of collaboration and groups all over the world to establish cutting-edge expertise and knowledge.

b. Teaching remit

State the roles/assignments etc. that you have had in relation to higher education and teaching.

- As assistant, associate and professor:
  - Lectures for medical students and clinical and research fellows instruction, Karolinska Institutet, (Sweden). *Since 11/2010*
  - Lectures in reconstructive surgery of the airway and principles of regenerative medicine. Faculty of Medicine, University of Florence, (Italy). *Since 10/2010*
  - Lecturer, principles of tissue engineering and cell therapy of respiratory diseases. Master of regenerative medicine, University of Modena (Italy). *Since 10/2010*
  - Lectures in principles of airway surgery and surgical techniques in general thoracic surgery; Principles of regenerative medicine, EU master in respiratory medicine. University of Barcelona (Spain). *04/2008–12/2010.*

- Lectures in lung and heart lung transplantation and tissue engineered replacements of intrathoracic organs and complex tissues. Master in organ transplantation. University of Barcelona (Spain). *02/2007-12/2009.*
- Director and Lecturer, Post-graduate program of general thoracic surgery, University of Barcelona (E). 03/2005- 12/2009.
- Lectures in thoracic trauma and extracorporeal lung support. Master Intensive Care Unit. University of Barcelona (Spain). *03/2005/12/2009.*
- Director of the Airway Surgical Program, and lecturer in anatomy, function and imaging of the trachea, diagnosis and treatment of benign tracheal stenosis and tracheaesophageal fistulas, surgical management of tracheal tumors, principles of pedriatric airway surgery, European School of Cardiothoracic Surgery, Bergamo (Italy). *01/2003-12/2007.*
- Director, Post-graduate program of general thoracic surgery, Heidehaus Hospital, Hannover Medical School (Germany). *04/2000-12/2004.*
- Lectures in general thoracic surgery and lung and heart-lung Transplantation, Faculty of Medicine, Paris-Sud University (France). *12/1993-04/1999.*
- Lectures to student first and second level, Faculty of Medicine, University of Pisa (Italy). *1/1988-12/1992.*

- As supervisor or (academic and hospital) program director:

  University of Pisa (Pisa, Italy)
  - 1988: Ruschi, Stefano. Title: Pulmonary function and bullous emphysema. Diploma in Pneumology. Published in: *Minerva Pneumol* 1990; 29:9-18.
  - 1989: Ricagna, Fabio. Title: *Functional results of sleeve lobectomy. Diploma in General Surgery*. Published in: *Eur J Cardio-Thorac Surg* 1991; 5:410-3.
  - 1990: Pieri, Marco. Title: *Most peripheral non small lung cancers have low proliferative rates and no intra- or peritumoral vessel invasion. Thesis in medicine and surgery.* Published in: *J Thorac Cardiovasc Surg* 1992; 104:892-9.

  University of Alabama at Birmingham (Alabama, USA)
  - 1991: Hsu, Chuanchieh. Title: *Invasion of blood vessels by tumor cells predictes recurrence of bronchogenic cancers*. Diploma in biomedical statistics. Published in: J Thorac Cardiovasc Surg 1993; 106:80-9.

  Université de Franche-Comté, (Besançon, France)
  - 1995: Murakami, Shinia. Title: *Prevention of reperfusion injury by inhaled nitric oxide in lungs harvested from non-heart-beating donors.* DEA in Transplantation d'Organe et Greffe de Tissu. Published in: *Ann Thorac Surg* 1996; 62:1632-8.
  - 1996: Bacha, Emile. Title: *Inhaled nitric oxide attenuates reperfusion injury in non-heart beating donor lung transplantation.* DEA in Transplantation d'Organe et Greffe de Tissu. Published in: *Transplantation* 1997; 63:1380-6.

- 1997: Guerra, Nadia. Title: *Polymerase chain reaction analysis of nude mice generated human tracheas transplanted in piglets.* DEA in Transplantation d'Organe et Greffe de Tissu. Published in: *Transplantation* 2000; 70: 1555-9.

<u>*Université d'Angers (Angers, France)*</u>

- 1998: Shukri, Tamara. Title: *Identification des antigènes responsable du rejet hyperaigue dans un modèle de xenotransplantation pulmonaire orthotopique cochon-chèvre. Diploma in Cellular Biology.*

<u>*Université de Rennes I (Rennes, France)*</u>

- 1998: Verhoye Jean-Philippe: *Tracheo-esophageal complications from mechanical ventilation. Thesis in Medicine et Chirurgie*. Published in: *J Thorac Cardiovasc Surg* 200; 121: 68-76.

<u>*Medizinische Hoschschule Hannover, Hannover, Germany*</u>

- 2003: Breitbach, Sven. Title: *Adenovirale Vektoren - PCR-gestütztes Screening zur Korrelation von Adenoviren und intrathorakalen Malignomen.* Thesis in medicine and surgery.
- 2003: Karsten Schroeder. Title: *Der Einfluß der Lymphadenektomie auf intrathorakale Volumina bei Lungenresektionen wegen nicht-kleinzelligem Bronchialkarzinom.*Thesis in medicine and surgery.
- 2003: Gruhn, Silke. Title: *Role der apnoische oxygenierung in der Trachealchirurgie.* Thesis in medicine and surgery.
- 2005: Karsten Kuhn. Title: *Evaluierung der transkardiopulmonalen Einzelindikator-Thermodilution nach Lungenresektionen wegen nicht-kleinzelligem Bronchialkarzinom unter besonderer Berücksichtigung der Lymphadenektomie.* Thesis in medicine and surgery.
- 2006: Biancosino, Christian. Title: *Generation of a bioartificial fibromuscular tissue with autoregenerative capacities for surgical reconstruction*. Thesis in medicine and surgery. Published in: *Cytotherapy* 2006;8(2):178-83.
- 2008: Lars, Jasper. Collaboration work with Eicken, Nicken. Title: *Cetriaxon, Amoxicillin und Ampicillin/ Sulbactam als perioperative Antibiotikaprophylaxe in der elektiven Lungenchirurgie*. Thesis in medicine and surgery.
- 2010: Nina Städtler. Title: *Prospektive Analyse der Ösophagusfunktion nach Pneumonektomie*. Thesis in medicine and surgery.
- Philipp Jungebluth. Title: *A potential approach for tracheal reconstruction: biotissue engineering of a tracheal tubular graft*. Thesis in medicine and surgery. Published in: *Lancet* 2008, *J Thorac Cardiovasc Surg* 2009 and 2010, and *Biomaterials* 2009.
- Johannes Haag. Title: *Improved biomechanics of tracheal natural scaffolds using cross-linking natural agents.* Thesis in medicine and surgery. (Expected sustenance: January 2012)
- Jafar Jorjani. Title: *Interrelation between intensive care patients and general thoracic surgery.* Thesis in medicine and surgery. (Expected sustenance: September 2012).

Faculty of medicine, University of Florence, Florence, Italy

- *Leonardo Polizzi.* Title*: Development of an animal model for bioengineered tracheal graft evaluation*. Thesis in medicine (expected sustenance, March 2012)

Post-doctoral (PHD) Supervisor:

University of Barcellona, Barcellona, Spain:

- Dr. Manoli Iglesias. Title: *Experimental and clinical extracorporeal mechanical ventilation in refractory acute distress respiratory syndrome*. (to be presented).
- Dr. David Sanchez. Title: *Pre-clinical efficacy of a novel extracorporeal ventilation device*. (to be presented).
- Dr. Alberto Rodriguez. Title: *Cellular and molecular endothelial dysfunction in chronic pulmonary embolism*. (to be presented).

Medizinische Hochschule Hannover, Hannover, Germany:

- Dr. Jungebluth Philipp. Title: Regenerative approaches to end-stage diseases of the airways. Expected sustenance: June 2013

Karolisnka Institutet, Stockholm, Sweden

- Sebastian Sjöqvist. Title: Tissue engineering and stem cell therapy for esophageal disorders. Clinical Scientist Training Programme (CSTP) Karolinska Institutet *(2011-2014)*

c. Nature and diversity of your teaching

This includes lectures, seminars, demonstrations, laboratory teaching, supervision during clinical work placement, PBL supervision, IT-based teaching, and/or individual project supervision.

Lectures:

- Lectures for medical students and clinical and research fellows instruction, Karolinska Institutet, Stockholm (Sweden).
- Lectures in reconstructive surgery of the airway (4th year) and principles of regenerative medicine (5th year). Faculty of Medicine, University of Florence (Italy).
- Lectures in principles of tissue engineering and cell therapy for respiratory diseases. Master of regenerative medicine, University of Modena (Italy)
- Lectures in principles of airway surgery and surgical techniques in general thoracic surgery (4th year); Principles of regenerative medicine (5th year), EU master in respiratory medicine. University of Barcelona (Spain).
- Lectures in lung and heart lung transplantation and tissue engineered replacements of intrathoracic organs and complex tissues. Master in organ transplantation. University of Barcelona (Spain).
- Director and Lecturer, Post-graduate program of general thoracic surgery, Hospital Clinic, University of Barcelona (Spain).
- Lectures in thoracic trauma and extracorporeal lung support. Master Intensive Care Unit. University of Barcelona (Spain).
- Director of the Airway Surgical Program, and Lecturer in anatomy, function and imaging of the trachea, diagnosis and treatment of

benign tracheal stenosis and tracheoesophageal fistulas, surgical management of tracheal tumors, principles of pedriatric airway surgery, European School of Cardiothoracic Surgery, Bergamo (Italy).

- Director, Post-graduate (Residents & Fellows) program of general thoracic surgery, Heidehaus Hospital, Hannover Medical School (Germany).
- Lectures in general thoracic surgery and lung and heart-lung Transplantation, Faculty of Medicine, Paris-Sud University (France).
- Lectures to student first and second level, Faculty of Medicine, University of Pisa (Italy).

Organized seminars:

- Principles of mechanical ventilation and aponoic oxygenetaion. Hannover, Germany, March 15, 2001.
- Surgical Therapies of the Bronchial Carcinoma, therapy and diagnostic. Hannover, Germany, March 15, 2003.
- Lung Cancer. Cancer information day: *"Der Mensch im Mittelpunkt"*. Oncological Circle Hannover. Hannover (D). March 22, 2003.
- Diagnosis and treatment of mediastinal tumors. Hannover, Germany, March 16, 2004.
- Current status of extracorporeal lung assist devices. University of Barcelona, Barcelona, Spain. April 4, 2006
- Surgical approach to pulmonary hypertension. University of Barcelona, Barcelona, Spain. June 7, 2007
- Regenerative approached to diseases of the respiratory system. . University of Barcelona, Barcelona, Spain. January 12, 2009

Individual project supervision and laboratory teaching: please see teaching remit

d. Examination and assessment

- Scope of and responsibility for different kinds of examination (theoretical, practical, oral or written) and development of assessment criteria.
  - Theoretical and practical exams (summer and winter session annually) at the Hannover Medical School (2000 and 2004);
  - Examiner and final evaluator of the national exams for the general thoracic surgeon specialization at the Lower Saxony medical chamber Germany (2000- 2004);
  - Theoretical and practical exams (summer and winter session annually) of the post-graduate courses in thoracic and general surgery and intensive care at the University of Barcelona, Barcelona, Spain (2005- 2009).

e. Production of teaching material

- All my educational /pedagogical activities over the years have been associated with educational booklets, textbooks and, more recently, with online material of the individual activities. They have been each time evaluated using a score system, and none has been scored insufficient.

- All my educational material, whether in form on printed teaching material (booklets, book chapter, synopsis) is available at the respective activity places.

f. Course evaluations and evaluations of teaching and education.

Course evaluations have always been useful feedback to obtain information about the impact of learning and of teaching practice on student learning and to improve my teaching quality.

g. Internationalisation

- Participation in teacher exchanges with overseas universities.
  - Erasmus Exchange program, Faculty of Medicine, University of Barcelona;
  - Honorary Professor of Surgery at the University College in London;
  - Invited Professor at the Russian Academy of Medical Sciences (RAMS) with Master classes for Regenerative Medicine and tissue engineering (20 hours/year), since 2010

1.2 Educational work in the field of healthcare and medicine, and for practising professionals.

Classes to Nurse High School (operative nurses)

- 1993-1996: Pathology of the Thorax (University Anger, Anger, France);
- 1996-1999: Heart-lung and Lung-Transplantation (University Paris-Sud, Paris, France);
- 1997-1999: Surgical intervention in lungs and bronchi (University Paul Vaillard, Villejuif, Paris France);
- As member of PTFZ (pedriatic research center, Hannover, Germany), monthly information meetings for patients, parents and physicians. The targets were to develop clinical trials, experimental projects, monitoring and evaluation of data and parameters, provide education and courses for both physicians and health care staff, providing web-based information and discussion forum, inclusive tele-medical approaches (2000-2004).

- Interprofessional collaboration and the training of practising professionals.
- Leader of an expert group for intrathoracic tumors (A II), (Hannover, Germany);
- Member of a monthly interdisciplinary conference (certificated by the National Medical Association (2 credtis) and by the Internal-Oncology group of the German Society of Cancer (AIO) (5 credits);
- Faculty Member of the Post-graduate European School for Cardiothoracic Surgery: general thoracic Surgery and post-operative management of thoracic surgery patients;
- Member of the Interdisciplinary pediatric thorax center (PTZH, Medizinische Hochschule Hannover). Center for Children and Teenager with congential and acquired severe diseases affecting thoracic organs with the necessity of interdisciplinary diagnostics and therapies;
- Giving lectures at international post-graduate courses (since 1991).

2 Development of educational knowledge

Internal and external courses attended in the subject area of *Teaching and Learning in Higher Education* (state organiser, scope and dates).

Internal courses: Weekly grand rounds, seminars, invited conferences in the fields of general thoracic surgery and regenerative medicine (Hannover Medical School, 1999-2004; University of Barcelona, 2005-2010);
External courses:
CME (continual medical educations) in the fields of cardiothoracic surgery (Hannover Medical School, 1999-2004; Hospital Clinic, University of Barcelona, 2005-2010). The following are selected symposiums, post-graduate courses, and educational meetings:

- *Symposium on Thoracoscopy and Video Assisted Thoracic Surgery*. 74th Post-graduate course of the Annual Meeting American Association of Thoracic Surgery (AATS), New York (USA), 24-27 April, 1994.
- Lung Xenotransplantation. *General Thoracic Biology Club*. 77th Post-graduate course of the Annual Meeting of the American Association of Thoracic Surgery. Washington DC (USA). May 4, 1997.
- Extended resection for lung cancer. *European School of Oncology.* Royal Brompton Hospital, London (UK), October 10-14, 1997.
- Epidemiology of lung diseases and its impact on thoracic surgery. In: *Management course in cardio-thoracic surgery*. Palma de Mallorca (Spain), November 23-25, 1997.
- The future of lung transplantation: lung xenotransplantation. *51 Annual Meeting of the Japanese Association of cardiothoracic surgery*. Post-graduate course. Tokyo (Japan), October 2-5, 1998.
- International training of a general thoracic surgeon. Thoracic surgery postgraduate course. *87th American College of Surgeons*, New Orleans (USA), October 18, 2001.
- Apnoeic tracheal surgery. *General Thoracic Surgery Post-graduate Course EACTS*, Monaco (Montecarlo), September 22, 2002.
- Pancoast Tumors. *Post-graduate course in General Thoracic Surgery. German Society for Thoracic and Cardiovascular Surgery*. Kiel (Germany), October 8, 2002.
- How I do it: Carinal resections. *Post-graduate Course General Thoracic Surgery. 83rd AATS Meeting*. Boston (USA), May 3rd, 2003.
- Surgery of the upper thoracic aperture. *1st Post-graduate course of the German-Italian Thoracic surgery*. Bolzano (Italy), November 22, 2003.
- Utilización de transplante de vasos cadavéricos en el tratamiento quirúrgico de los tumores intratorácicos. *III Simposio Oncológico para Profesionales Sanitarios*. Benavente (Spain), 20-21 October, 2006.
- Tratamiento quirúrgico de la hipertensión arterial pulmonar. Hipertensión Pulmonar. *IV Curso práctico de actualización cardiovascular.*Barcelona (Spain), 2-3 November, 2006.
- Rare tumors: Chest wall tumors. *ESMO International Symposium (EIS) of Chest Tumors*. Geneva (Switzerland), 30 March – 1 April, 2007.
- Resección de la carina traqueal: planteamiento teórico. *Curso de Actualización en Técnicas Quirúrgicas Torácicas*. Salamanca (Spain), 29-30 May, 2007.

- Resección y reconstrucción de la vena cava superior. Enfermedad Vascular Pulmonar. *Curso FMC-SEPAR*. Castelldefels (Spain), 5-6 October, 2007.
- Conferencia Inagural: Asistencia Ventilatoria Extracoporal. *Ier Seminario Cuidados Respiratorios*. Ciudad Real (Spain), 27-29 February, 2008.
- Presentación teórica: Cómo lo hago. Abordaje transpericárdico de la carina traqueal. *II Curso Avanzado de Cirugía Torácica. Hospital Universitario de Salamanca.*Salamanca (E), 16-18 June, 2008.
- Tracheo-bronchial transplantation. ESTS – *European Society of Thoracic Surgeons*. Post-gElancourt, Paris (France) 2-3 March, 2009.
- Il futuro dei trapianti clinici con tessuti ingegnerizzati. *8º Corso di formazione avanzata. Medicina Rigenerativa cellulare: realtà e prospettive.* Collegio Ghislieri , Pavia (Italy). 20 March, 2009.
- Tissue and cell engineering. Annual Meeting of INFARMED Ministry of Healt (Medicamentos e productos de saude: Inovacao, acessibilitade e sustentabilidade). Lisboa (Portugal), 15 May 2009.
- Tissue engineering cell restoration and replacement. *Conference of the EACTS on advanced therapies in general thoracic surgery.*Post-gradiate course. Wien (Austria), 21st October 2009.
- Progress in airway surgery. *46th Annual Meeting of the Society of Thoracic Surgeon (Techno-College Post-graduate course).* Fort Lauderdale (USA) January 2010.
- Tracheal Reconstruction with Tissue Engineered Airway. *90th Annual Meeting of the American Association of Thoracic Surgery. Post-graduate Course.*Toronto (Canada), May 1-5, 2010.
- *General Thoracic Surgery Harvard Medical School Course*, Boston (USA) May 27-28, 2010.
- Stem Cell Symposium. Airway tissue engineering. *5th young European scientist meeting*. Porto (Portugal) 24-26 September, 2010.
- Research design and preparing grant proposal in thoracic surgery. *6th National Thoracic Surgery Congress*. Post-graduate course. Antalya (Turkey) April 30, 2011.
- Tissue engineering and cell therapy for the respiratory system. *American Thoracic Society International Conference*. Post-graduate course. Denver (USA), May 16, 2011.

- Other educational /pedagogical activities. All above listed all international educational and/or pedagogical conferences that I have taken and attended.

3 Examples of teaching, supervision or examination development

- Each course has been organized using lesson plans in order to be performed with a sequential and logical teaching order. Furthermore, each single lesson had a teaching objective and was structured in a clear way to foster student understanding. A questionnaire, gathering information about lectures (seeking general information about the course, the course contents and the lecturer characteristics) was used to evaluate student understanding.
- Evaluation by students has been done after each course/lecture (Hannover 2000-2004 and Barcellona (2005-2009). Analysis of student writing, projects, essays, and oral presentations were used to evaluate student understanding of my teaching. Based on this, the educational activity of the next academic year was confirmed/improved.

- To me, the prove of my teaching activity is that almost all of my previous students and fellows contact me frequently to get advices and discuss issues. Nine out of 12 fellows in general thoracic surgery have become chief of thoracic surgery in Germany and Spain.
- You can also describe your pedagogical distinctions here, giving a brief account of why you have received them. None

4 Contributions to educational development within organisations

4.1 Educational development and research

- Describe the educational development, research and projects that you have done. State whether you have done this work alone or in collaboration with others.
- State your involvement in educational committees or the like. Describe the areas of responsibility, how the work was organised, the underlying ideas, and the outcomes.
  - Faculty Member, European School for Cardiothoracic Surgery: General Thoracic Surgery and post-operative management of thoracic surgery patients;
  - Chairman, Research and Research Funding, European Association Cardio-thoracic Surgery (EACTS);
  - Scientific Council on Pulmonary Transplantation, International Society of Heart-Lung Transplantation;
  - European Union Liaison, Post-graduate Education, Young Investigator Awards, EACTS;
  - Surgical Treatment of End-Stage, Cardiopulmonary Disease Committee, Society of Thoracic Surgeons
  - Member of the annual medical student educational program for Thoracic Surgery (Medizinische Hochschule Hannover, Germany): planning, designing and practical and oral examinations and clinical training
- Describe your involvement in presentations of educational development projects at a local, national or international level. None
- Describe investigations into your own or other teachers' work or education-related questions. Also state how and in which contexts the results have been reviewed by, communicated or presented to others (e.g. in scientific publications). None
- Other publications influencing my teaching: All most peer-reviewed articles in the domains of general thoracic surgery and regenerative medicine

4.2 Collaboration with the wider community

- Member of the Interdisciplinary pediatric thoracic center (MHH, Hannover);
- Information for patients' association (red cross, etc.), parents and physicians developing clinical trials and experimental projects;
- Monitoring and evaluation of data and parameters;
- Education and courses for both physicians and health care staff;

5 Other qualifications

- Give an account of other educational qualifications that you would like to be considered in the assessment of your educational competence

6 Thoughts about your own professional input

a. My teaching, supervision and/or assessment quality improved mainly due to the feedbacks obtained by the student evaluation of my lessons (obtained both by questionnaires and directly speaking with the students). Based on these feedbacks, my educational activity (lesson objectives, lesson plans, student evaluation) was confirmed/improved each year.

b. My educational plans are mainly focused on the development of an European Airway School by which raise interests of surgical residents, fellows and junior staff in translational medicine and basic science, giving them the opportunities of training in research laboratories and clinical departments in several EU countries and academic institutions in the different domains of diseases of the respiratory system.

KAROLINSKA INSTITUTET
CLINICAL PORTFOLIO

Approved by the Board of Research, January 1st 2008

AIMS

Good healthcare and clinical competence are prerequisites for successful clinical research of high quality. Clinical competence is also essential to ensure that new research findings can be put into clinical practice for the benefit of patients as quickly as possible. It is therefore essential that clinical competence should be evaluated systematically when appointments are being made to academic posts with a clinical connection.

Clinical competence covers all clinical activities.

The following areas can be documented and/or described by applicants for clinical appointments.

CONTENTS

1. Clinical competence and formal training
2. Clinical development work

1. Clinical competence and formal training

This section documents (with dated information):

- Completed clinical training documented through specialist competence/further education (a specialist degree counts as a merit).

2000	Specialisation in Thoracic Surgery. Medical Council Low Saxony, Hannover, Germany
1/1991-12/1993	Specialisation in Organ and Tissue Transplantation. University: University of Franche-Côompte, Beçanson, France
1/1992-12/1995	Fellow in Cardio-thoracic and vascular Surgery. Department of Thoracic and Vascular Surgery and Heart-Lung Transplantation, Hôpital Marie-Lannelongue, Paris-Sud University, Le Plessis Robinson, France
11/1986-12/1991	Specialisation in General Surgery. Title of Thesis: Neoangiogenesis in non-small cell lung cancer. Main supervisor: Prof. Mario Selli. University: University of Pisa, Pisa, Italy
1/1990 – 12/1991	Clinical Fellow in General Thoracic Surgery, Department of General Thoracic Surgery, University of Alabama at Birmingham, Birmingham, Alabama, USA
10/1986-12/1990	Residency in General Surgery, Departement of Surgery, University of Pisa, Italy

- Number of years' service as a specialist (up to 10 years).
    - 20 years as general surgeons;
    - 18 years as transplant surgeons;
    - 11 years as general thoracic surgeon.

- Experience of inpatient and outpatient care.
    - Since 1993, Dr. Macchiarini has had a own outpatient clinic reflecting his continuing interest in the clinical field of lung transplantation, airway surgery, and complex thoracic surgeries;
    - Since 1993, Dr. Macchiarini has been the responsible of the patients recovered on the different tertriary hospitals were he has been appointed, including the preoperative, surgical and post-operative care.

- Appointment as chief medical officer.

Since 12/2010	Consultant, Karolinska University Hospital Huddinge, Huddinge, Sweden
Since 1/2010	Consultant, Department of General Thoracic Surgery, University Hospital Careggi, Florence, Italy
01/2005-12/2009	Chairman and Senior Consultant, Department of General Thoracic Surgery Hospital Clinic, University of Barcelona, Barcelona, Spain)
1/2003-12/2004	Medical Director, Heidehaus Hospital, Hannover Medical School, Hannover, Germany

04/1999-12/2004	Chairman, Department of General Thoracic and Vascular Surgery, Heidehaus Hospital, Hannover Medical School, Hannover, Germany)
08/1995-03/1999	Consultant, Department of Thoracic and Vascular Surgery and Heart-Lung Transplantation, Hôpital Marie-Lannelongue, Paris-Sud University, Le Plessis Robinson, France

- Participation in on-call services (number of years on standby duty).
  - On-call as Consultant at the Karolinska University Hospital in Huddinge for the airway transplant program. Stockholm (Sweden), since 1/2011;
  - On-call as Chairman and Senior Consultant, Department of General Thoracic Surgery Hospital Clinic, University of Barcelona, Barcelona (Spain), from 01/2005 to 12/2009;
  - On-call as Chairman, Department of General Thoracic and Vascular Surgery, Heidehaus Hospital, Hannover Medical School, Hannover (Germany), from 04/1999 to 12/2004;
  - On-call and standby duty as Consultant, Department of Thoracic and Vascular Surgery and Heart-Lung Transplantation, Hôpital Marie-Lannelongue, Paris-Sud University, Le Plessis Robinson (France), from 08/1995 to 03/1999.

- Special clinical competence/profile areas (special knowledge which, for example, has led to referral of patients regionally or nationally).

  Dr. Macchiarini's special areas of clinical interest involve complex diseases including:
  - Adult and Pediatric Tracheal Surgery;
  - Extended Surgery for Lung, Esophageal, and Mediastinal Tumors;
  - Airway and Lung Transplantation;
  - Surgical therapy for end-stage lung diseases including pulmonary endarterectomy, lung volume reduction surgery and regional lung perfusion;
  - (Bio)Artificial Lung;
  - Stem cells treatment and tissue engineering replacement for respiratory diseases

- Documentation of clinical competence (width and quality).
  - Dr. Macchiarini has been in a leading clinical (Chairman of Departments of Thoracic Surgery at the Hannover Medical School Hospital Heidehaus first and then at the Hospital Clinic of the University of Barcelona) position since 1999;
  - During this periods, there was always an annual 10 to 15% increase of the number of recovered patients with the top 10 DRG (diagnosis related-groups);
  - The clinical competence has always been made by stressing the importance of the *a)* relation between minimal activity and quality (more translates into

better quality and reduced costs, and *b)* quality management (QM) and clinical pathways (CP) to enhance the Hospital's market position and ranking.

- Assignments within healthcare organisations and other authorities/organisations as a result of clinical competence.
    - Surgical Treatment of End-Stage, Cardiopulmonary Disease Committe, Society of Thoracic Surgeons, USA (2008-2012)
    - DFG (Deutsche Forschungsgemeinschaft, Germany). Domain: Organ and Tissue Transplantation (2002-2006)
    - Wellcome Trust (UK). Domain: Regenerative Medicine (2008-present)
    - Italian Association for Research in Cancer (Italy). Domain: Experimental cancer research (2007-2008)
    - EU evaluator FP7 (EU, Brussels). Domain: Regenerative medicine and organ transplantation (2010-2013)
    - EMEA (European Medical Agency). Domain: Stem cell and tissue engineering for end-stage lung diseases (since 2009)
    - ASPEN Institute Italia, Milan, Italy (since 2009)
    - European Postgraduate school of Cardiothoracic surgery
    - Clinical Advisory Board, Technology and Innovation Center (http://www.innovateuk.org/content/news/new-cell-therapy-technology-and-innovation-centre.ashx)
    - Clinical Advisory Board, Technology Strategy Board (UK funding agency for industry) - http://www.innovateuk.org/

2. Clinical development work

This section documents contributions which have improved healthcare or have been valuable in terms of cost-effectiveness, as well as participation in clinical training.

- Development/establishment/evaluation of new treatment strategies.
    - Advances in neo-adjuvant treatment for non small cell cancer
    - First evidence of the relations between neovascularization and metastasis in non small cell lung cancer;
    - Technical advances of pulmonary thromboendarterectomy for chronic pulmonary hypertension;
    - Technical advances of surgery for subglottic tracheal stenosis and trachea-esophageal fistula;
    - Technical advances in complex tracheobronchial reconstruction in pediatric and adult patients;
    - Development of awake airway surgery;
    - Development of the T, N, and M staging system for primary tracheal malignancies;
    - Development of extracorporeal pumpless artificial lung and first clinical elective implantations in patients with post-surgical acute respiratory distress syndromes;
    - Performed the first clinical implantation of a tissue engineered airway patch;
    - Performed the first clinical transplantation of tissue engineered natural airway;

- Performed the first clinical transplantation of a tissue engineered natural airway on pediatric patient;
- Performed the first clinical transplantation of a tissue engineered natural airway on oncological patients;
- Performed the first clinical transplantation of a tissue engineered synthetic airway;

- Development of health-care programmes.
  - During my offices of Chairman of Departments, the annual health-programme (financial budget, type of care, *etc.*) was yearly discussed and programmed and monthly monitorid with the Hospital administrative authorities first and then with the national Insurance companies (Germany) and National Health System (Spain).

- Clinical supervision during specialist and/or further training.
  - Director, Post-graduate program of general thoracic surgery (Residents and Fellows), Hospital Clínic, University of Barcelona, Barcelona (Spain) 03/2005-12/2009;

  - Director, Post-graduate (Residents & Fellows) program of general thoracic surgery, Heidehaus Hospital, Hannover Medical School, Hannover (Germany) 04/2000-12/2004;

  - Participation in pharmaceutical recommendations, pharmaceutical committee work.
    - "Advanced Therapy" committees for stem cell-based therapy for the European Medical Agency, London (UK)

KAROLINSKA INSTITUTET
LEADERSHIP, DEVELOPMENT AND WORKPLACE RELATIONS PORTFOLIO

Approved by the Board of Research, January 1st 2008

AIMS

Successful research and education cannot be achieved in the modern university without well-defined leadership, good collaboration and a number of administrative support functions. This creates a need for multiple skills and a productive interplay between research, education and administration, as well as the care of patients in the clinical departments. It is important that all these skills are appraised at the time of recruitment. Measurable criteria in each area need to be clearly defined so that applicants are encouraged to structure their applications in such a way that their skills are highlighted. The expert advisers can then assess the applicants on the basis of the job profile determined by KI, thus providing a valuable basis of assessment for the recruitment committee.

CONTENTS

1. Formal education within leadership, development and workplace relations
2. Leadership
   - 2.1 Leadership positions
   - 2.2 Supervisor/lecturer/mentor
   - 2.3 Workplace and social leadership competence
   - 2.4 Clinical leadership and co-operation competence
3. Strategic competence
   - 3.1 Innovation experience
   - 3.2 Entrepreneurship
4. Workplace relations
   - 4.1 Collaboration with the community
   - 4.2 Committee work
   - 4.3 Active work on ethical issues, equal opportunities, the workplace environment and environmental questions

1 Formal education within leadership, development and workplace relations

This section documents formal qualifications in the areas of finance, personnel administration and leadership, as well as ethical issues, equal opportunities, the workplace environment and environmental questions

2 Leadership

2.1 Leadership positions

This section documents positions of responsibility and leadership both within and outside the academic world:

- Chairmanship of academic boards or similar bodies, investigations, national and international projects etc (number and type).

  Chairman, academic board:
  - Research and Research Funding, European Association Cardio-thoracic Surgery (EACTS)
  - Surgical infection disease, Hannover Medical School
  - Equal Opportunities, Hannover Meedical School

  Chairman, recruitment board:
  - Recruitment of chairman of pneumology, Hannover medical School, 2003: Prof. Welte T;
  - Recruitment of chairman of pneumology, Heidehaus Hospital, Hannover Medical School, 2004: Prof. Schoenhofer B;
  - Recruitment of professor and chairman at the Department of Cardiac Surgery of the Hospital Clinic, University of Barcellona: Prof. Pomar JL.

  International projects leader:
  - Director, European Airway Institute, Division of ENT (CLINTEC), University Hospital Huddinge, Sweden
  - Director, CERT (European Research Thoracic Center), Florence, Italy

- Congress organiser (number and type)
  - Principles of mechanical ventilation and aponoic oxygenation. Hannover, Germany, March 15, 2001.
  - Surgical Therapies of the Bronchial Carcinoma, therapy and diagnostic. Hannover, Germany, March 15, 2003.
  - Lung Cancer. Cancer information day: *"Der Mensch im Mittelpunkt"*. Oncoligical Circle Hannover. Hannover (D). March 22, 2003.
  - Diagnosis and treatment of mediastinal tumors. Hannover, Germany, March 16, 2004.
  - Current status of extracorporeal lung assiste devices. University of Barcellona, Barcellona, Spain. April 4, 2006
  - Surgical approach to pulmonary hypertension. . University of Barcellona, Barcellona, Spain. June 7, 2007
  - Regenerative approached to diseases of the respiratory system. University of Barcellona, Barcellona, Spain. January 12, 2009

- Board membership in companies, public authorities and national or international organisations (number and type).
  - Company: none
  - Public Authorities:
    - DFG (Deutsche Forschungsgemeinschaft, Germany). Domain: Organ and Tissue Transplantation (2002-2006)
    - Wellcome Trust (UK). Domain: Regenerative Medicine (2008-present)
    - Italian Association for Research in Cancer (Italy). Domain: Experimental cancer research (2007-2008)
    - EU evaluator FP7 (EU, Brussels). Domain: Regenerative medicine and organ transplantation (2010-2013)
    - EMEA (European Medical Agency, London, Uk). Domain: Stem cell and tissue engineering for end-stage lung diseases (since 2009)
    - ASPEN Institute Italia, Milan (Italy) (since 2009)
    - European postgraduate school of Cardiothoracic surgery
    - Clinical Advisory Board, Technology and Innovation Center (http://www.innovateuk.org/content/news/new-cell-therapy-technology-and-innovation-centre.ashx)
    - Clinical Advisory Board, Technology Strategy Board (UK funding agency for industry) - http://www.innovateuk.org/
  - National and International organisations:
    - Chairman, Research and Research Funding, European Association Cardio-thoracic Surgery (EACTS)
    - Scientific Council on Pulmonary Transplantation, International Society of Heart-Lung Transplantation
    - European Union Liaison, EACTS
    - Post-graduate Education, EACTS
    - Young Investigator Awards, EACTS
    - General Thoracic Biology Club, AATS
    - Hans Borst Award Committee, EACTS
    - Surgical Treatment of End-Stage, Cardiopulmonary Disease Committe, Society of Thoracic Surgeons
- Head of section, director of studies, programme director, education responsibility.
  - Head of Departments:
    - Department of General Thoracic Surgery Hospital Clinic, University of Barcelona, Barcelona (Spain). From 01/2005 to 12/2009;
    - Medical Director, Heidehaus Hospital, Hannover Medical School, Hannover (Germany). From 1/2003 to 12/2004;
    - Department of General Thoracic and Vascular Surgery, Heidehaus Hospital, Hannover Medical School, Hannover (Germany). Between 04/1999 and12/2004.
  - Programme director:
    - Post-graduate (Residents and Fellows) program of general thoracic surgery *(http://www.aekn.de).* Hannover medical School, Hannover, (Germany). Between 01/2000 and 12/2004

- Post-graduate (Residents and Fellows) program of general thoracic surgery (*http://www.separ.es/separ-mir/programa_formacion.html).* Hospital Clinico de Barcellona, Faculty of Medicine, University of Barcelona, Barcelona (Spain). Between 01/2005 and 12/2009.

- Education responsability:
  - Lectures for medical students and clinical and research fellows instruction, Karolinska Institutet, Stockholm (Sweden).
  - Lectures in reconstructive surgery of the airway (4th year) and principles of regenerative medicine (5th year). Faculty of Medicine, University of Florence, Florence (Italy).
  - Lectures in principles of tissue engineering and cell therapy for respiratory diseases. Master of regenerative medicine, University of Modena, Modena (Italy)
  - Lectures in principles of airway surgery and surgical techniques in general thoracic surgery (4th year); Principles of regenerative medicine (5th year), EU master in respiratory medicine. University of Barcelona, Barcelona (Spain).
  - Lectures in lung and heart lung transplantation and tissue engineered replacements of intrathoracic organs and complex tissues. Master in organ transplantation. University of Barcelona, Barcelona (Spain).
  - Director and Lecturer, Post-graduate program of general thoracic surgery, Hospital Clínic, University of Barcelona, Barcelona (Spain).
  - Lectures in thoracic trauma and extracorporeal lung support. Master Intensive Care Unit. University of Barcelona, Barcelona (Spain).
  - Director of the Airway Surgical Program, and lecturer in anatomy, function and imaging of the trachea, diagnosis and treatment of benign tracheal stenosis and tracheoesophageal fistulas, surgical management of tracheal tumors, principles of pedriatric airway surgery, European School of CardioThoracic Surgery, Bergamo (Italy).
  - Director, Post-graduate (Residents & Fellows) program of general thoracic surgery, Heidehaus Hospital, Hannover Medical School, Hannover (Germany).
  - Lectures in general thoracic surgery and lung and heart-lung Transplantation, Faculty of Medicine, Paris-Sud University, Paris (France).
  - Lectures to student first and second leve, Faculty of Medicine, University of Pisa (Italy).

2.2 Supervisor/lecturer/mentor

This section documents:

- Mentoring. All residents and fellows that I have been assigned form the Ministry of Education in Germany, Spain and Italy during my office as Chairman of the Departments of General Thoracic Surgery at the Medizinische Hochschule in Hannover, the University Hospital Clinic in Barcelona and the University Hospital Careggi in Florence have been mentored during their courses, from the beginning to the final oral exams, passing through the surgical knowledgements and skills acquisition of all procedures required by the law to become specialized in general thoracic surgery.

- Supervision of colleagues/doctoral candidates who have been awarded positions of trust or have been promoted.

  - *Doctoral candidates:*
    - Verhoye, Jean-Philippe: Title : *Tracheo-esophageal complications from mechanical ventilation*. Thesis in Medicine et Chirurgie. 1998 Université de Rennes I (Rennes, France).

    - Karsten Kuhn. Title: *Evaluierung der transkardiopulmonalen Einzelindikator-Thermodilution nach Lungenresektionen wegen nichtkleinzelligem Bronchialkarzinom unter besonderer Berücksichtigung der Lymphadenektomie.* Medizinische Hochschule Hannover (Germany), 2005.

    - Christian Biancosino. Title: *Generation of a bioartificial fibromuscular tissue with autoregenerative capacities for surgical reconstruction*. Medizinische Hochschule Hannover (Germany), 2006.

    - Eike Nicke and Lars-Oliver Jasper. Title: *Perioperative Antibiotika-prophylaxe in der elektiven Lungenchirurgie: prospective Anwendung-sbeobachtung mit "single-shot" Rocephin und retrospektive Kontrollanalyse zweier prolongierter Prophylaxe-Regime mit Augmentan und Unacid; klinische Wirksamkeit und Kosteneffizienz*. Medizinische Hochschule Hannover (Germany), 2008.

    - Nina Städtler. Title: *Prospektive Analyse der Ösophagusfunktion nach Pneumonektomie*. Medizinische Hochschule Hannover (Germany), 2010.

    - Philipp Jungebluth. Title: *A potential approach for tracheal reconstruction: biotissue engineering of a tracheal tubular graft*. Medizinische Hochschule Hannover (Germany), 2010. (Chief Supervisor). Dr. Jungebluth is actually Research Fellow at the Karolinska Institutet.

  - *Postdoctoral candidates:*
    - Dr. Manoli Iglesias. Title: *Experimental and clinical extracorporeal mechanical ventilation in refractory acute distress respiratory syndrome*. University of Barcelona. Expected sustenance: June 2012.
    - Dr. David Sanchez. Title: *Pre-clinical efficacy of a novel extracorporeal ventilation device*. University of Barcelona. Expected sustenance: June 2012.
    - Dr. Alberto Rodriguez. Title: *Cellular and molecular endothelial dysfunction in chronic pulmonary embolism*. University of Barcelona. Expected sustenance: June 2012.
    - Dr. Jungebluth Philipp. Title: Regenerative approaches to end-stage diseases of the airways. (Medizinische Hochschule Hannover (Germany). Expected sustenance: June 2013.

2.3 Workplace and social leadership competence

The workplace and social leadership competences of Dr. Macchiarini can be testified by the following referees:

- Workplace leadership competence
  - Sweden
    - Professor Li Tsai Fellander, MD
      Division of Orthopedics,
      Department of Clinical Science, Intervention and Technology (CLINTEC)
      Karolinska University Hospital, Huddinge
      Tel: +46858587191; Mobile: +46704848492
      E-mail: li.tsai@ki.se

    - Professor Lars Olaf Cardell, MD
      Division of Ear, Nose and Throat Diseases (CLINTEC)
      Karolinska University Hospital, Huddinge
      Tel: +46858581453; Mobile: +46707709926
      E-mail: lars_olaf.cardell@ki.se

  - Spain: Jose Luis Pomar, M.D., Ph.D.
    Surgical Director, Thoracic Institut
    Hospital Clinic, University of Barcelona,
    Villarroel 170
    E-08036, Barcelona
    Tel:+34 934514760; Fax: +34934514898
    E-mail: jlpomar@clinic.ub.es

  - Germany:
    Harringer Wolfgang, MD, PhD
    Department of Cardiothoracic Surgery
    Hannover Medical School
    Salzdahlumer Strasse 90
    D-38126 Braunschweig
    Tel: +495315952213 ; Fax: +495315952658
    Email: htg@klinikum-braunschweig.de

- Social leadership competence
  Professor Dame Julia Polak, DBE, MD, DSc, FRCP, FRCPath, FMedSci, Department of Chemical Engineering Imperial College.
  Professor of Pathology and Regenerative Medicine
  South Kensington Campus. London SW7 2AZ.
  Tel: +44-20-7594-5623; Mobile: +447792544245
  Email: julia.polak@imperial.ac.uk

  Professor Chris Mason MBBS, PhD, FSB, FRCSI, FRCS
  Chair of Regenerative Medicine Bioprocessing
  Advanced Centre for Biochemical Engineering
  Dept. of Biochemical Engineering, University College London
  Roberts Building, Torrington Place

UK-London WC1E 7JE
Tel: +4420 7679 0140; Cell: +44 771 4671158
Fax: +4420 7209 0703**;** Email: chris@chrismason.com

The names of referees, service certificates and other types of written evaluations from employers and clients should be submitted as a basis for evaluation of workplace and leadership competence. E-mail addresses and telephone numbers should also be quoted for persons named as referees.

2.4 Clinical leadership and co-operation competence

This section documents the ability to organise various activities and to lead organisations. This includes:

- Overall top management responsibility/departmental responsibility.
  - Department of General Thoracic Surgery Hospital Clinic, University of Barcelona, Barcelona (Spain). From 01/2005 to 12/2009;
  - Medical Director, Heidehaus Hospital, Hannover Medical School, Hannover (Germany). From 1/2003 to 12/2004;
  - Department of General Thoracic and Vascular Surgery, Heidehaus Hospital, Hannover Medical School, Hannover (Germany). Between 04/1999 and 12/2004.
  - Director, European Airway Institute, Division of ENT (CLINTEC), University Hospital Huddinge (Sweden). Since September 2011.
  - Director, CERT (European Research Thoracic Center), Florence (Italy). Since June 2011

- Administrative assignments within healthcare.
  - Chairman, Department of General Thoracic Surgery Hospital Clinic, University of Barcelona, Barcelona (Spain). From 01/2005 to 12/2009;
  - Medical Director, Heidehaus Hospital (Departments of thoracic and vascular surgery and pneumology), Hannover Medical School, Hannover (Germany). From 1/2003 to 12/2004;
  - Chairman, Department of General Thoracic and Vascular Surgery, Heidehaus Hospital, Hannover Medical School, Hannover (Germany). Between 04/1999 and 12/2004.
  - Director, CERT (European Research Thoracic Center), Florence (Italy). Since June 2011
  - Director, European Airway Institute, Division of ENT (CLINTEC), University Hospital Huddinge (Sweden). Since September 2011.

The two above mentioned duties have been accomplished by preservating the connection among clinical practice, education, and academics and, for this purpose, research, innovation, and technology development have been absolutely critical. A set of realistic short- and long-term goals and operational systems were articulated and prioritized:

- Not simply be as a clinical back-up;
- Re-train clinical skills;
- Select “competitive” clinical programs;
- Resist de-centralization;
- More horizontal population-based planning;

- Redefine expectations of our medical colleagues;
- New alliances with hospital administrations;
- Keep thoracic and cardiac surgery together;
- Preserve the viability of the academic medical center;
- Educational priorities and Academic responsibilities.

- Implementing quality work.

  During my offices as Chairman of Surgical Departments, my priorities have been the implementation of high-quality care targeting to ameliorate and re-structured the already present clinical activity to such an extend that all surgical fields of the General Thoracic Surgery were covered within the frame of the financial Diagnosi Related Group (DRG)-resources. This reciprocity is the only one assuring the survival and development of a "modern" (and competitive) General Thoracic Surgery, so that the TOP-10 DRG-diagnosis and operations can be offered to an unlimited horizontal population. In this sense, the primaries priorities were to re-organize the Departments that I was called to direct as such and re-structure the surgical area by implementing the following:

Surgical organizational priorities

Introduce Quality Management and Clinical Pathway
Elaborate flexible but productive working times
Reduce waiting list to clinical acceptance
Embrace advanced intrathoracic disease
Develop new surgical programs
Develop major outpatient day-surgery (endoscopy)
Increase and improve collaboration with referring centers
Enhance product competition
Develop a model of ICU for complex procedures
Increase number of national and international private patients

- Building up team-based/multi-disciplinary collaborative clinical projects.

  This has been always very important structural step toward the development of a exceptionally national and international competitive Hospital. This because new driving forces including costs/benefits and DRG pressures, press and web information, and increased patients' expectations will define the Hospital marketing. Indeed, the intergration of multidisciplinary competences is essential to become a leading European center and among the foremost world competence centers in the clinical field.

The actual and intial projects of the European Airway Institute dedicated to education, training and research and the European Center of Thoracic Research, dedicated to the research in the regenerative approaches to airway diseases represent compelling evidence on this team-based/multidisciplinary collaborative clinical projects. Another significant example of multi-disciplinary and international collaboration is the most recent first tracheobronchial transplantation using stem cells seeded bioartificial nanocomposite, done at the Karolinska University Hospital (http://online.wsj.com/article/SB10001424052702304793504576432093996469056.html)

- Ability to lead and co-operate with colleagues and other personnel groups within healthcare.

  As Chairman of Departments and Medical Director of the University Hospital Heidehaus in Hannover (Germany), these were *sine qua non* conditions within the medical and administrative Departments and national health-care providers. Moreover, I always asked and obtained that the Directorship should be made as well by one representative of the nurse personnel, one of the junior staff including medical doctors, and one of the senior staff members. This by general Hospital votation, on a basis of a two-years mandate to give stability to the project.

3 Strategic competence

3.1 Innovation experience

This section documents ability in strategic planning and entrepreneurial flair (investigations, development of units such as companies, centres, assignments on the dissemination of information etc).

- Patent
  - List of filed patent applications and patent rights:.
    - Synthetic scaffolds and airway transplantations (US serial number 61/505,096)
  - Name of the invention.
  - Name of the applicant and inventor (co-applicant and co-inventor).
  - Present owner of patent. Macchiarini Paolo and Seifalian Alex
  - Contract (licence)
- Intellectual property law
  - Protection of design. None
  - Trademark protection. None
- Development of product
  - List of inventions or products e.g. instrument, diagnostics, methods of analysis, or other services that have been commercialized or brought into the market. (When applicable, provide a market analysis). None
- Other experiences from innovations

- Experience from research and development work within commerce and industry. List company or organisation, task and position, as well as time span. None
- Other. None

3.2 Entrepreneurship

This section documents entrepreneurship

- Self-employment
  - Participation in establishment of a company. List names of co-founders. Type of company. Short description of the company. Present relation to the company. Turnover and number of present employees. Specify your contribution. None
  - Present and previously assignments as member of the board in companies. Time span. Short description of the company. None

- Other competence from entrepreneurship
  - Participation in establishment of a new activity, organisation, unit, centre of excellence etc. Specify your contribution, concentration and goal as well as size of the organisation.
    - European Research Thoracic Center (CERT), Florence, Italy.
      - This center has been created after approval in June 2011 by the parlament of the region Tuscany, Italy, and aims to promote excellence of research in the fields of airway and general thoracic and regenerative surgeries and intrathoracic biotransplantation. Funded by public funds of the region Tuscany, Italy, it is composed by Director that coordinates a scientific comitee to raise and supervise research project in the different fields of the above domains, educate young doctoral and post-doctoral candidates at national level, and provide guidelines for the must cutting-edges therapies in the clinical fields of the above clinical sciences. Through a special convention between the Tuscany region and the University Hospital Careggi in Florence, the Director of the CERT will perform all complex regional and national surgical airway cases. More instruction can be found under: http://www.regione.toscana.it/regione/multimedia/RT/documents/2011/07/27/55eb08cff047ae56aa8809fe54d06e51_parteiin30del27072011.pdf

    - European Airway Institute (EAI), Division of ENT (CLINTEC), University Hospital Huddinge, Sweden. Since September 2011.
      - This Institute has been establish as an international, tri-partite Centre of Excellence dedicated to patient care, research, training and education in the field of complex disorders of the larynx, trachea and bronchus. This will draw upon the respective strengths of the three centres in Sweden (Karolinska), UK (University College London) and Italy (University Hospital Careggi). The intention is not to duplicate activity in all three, but promote better

care through a close, collaborative network. In this way, an unique world-class referral centre for this neglected and difficult-to-treat group of patients will be formed, a new range of treatments will be pioneered and the next generation of dedicated healthcare professionals in this field will be trained. The three centres for this network and their respective strengths will be (in no special order): a) The Department of ENT, Karolinska University Hospital, Karolinska Institute, Stockholm, Sweden; the Departments of ENT and Respiratory Medicine, University College Hospital, London and Great Ormond Street Hospital, London, UK, and the Department of General Thoracic, University Hospital Careggi, Florence, Italy. Dr. Macchiarini has been appointed recently Director of the EAI with the task of organizing and structuring the Institute.

- Advanced Center for Translational Regenerative Medicine (ACTREG), Division of ENT (CLINTEC), Stockholm, Sweden
  - ACTREG was launched at the Karolinska Institutet in 2011 as a resource dedicated to the understanding and development and subsequent clinical transfer of novel therapies to regenerate damaged tissues and organs using cell therapy and tissue engineering approaches. Emphasis is given on the training and education of young academics in the field of translational regenerative medicine. Through association with the Karolinska Institutet, ACTREG is well positioned at the center of a consortium of world-class scientists and clinicians with diverse areas of expertise and a worldwide network of expert collaborators. Dr. Macchiarini has been appointed recently Director of the ACTREG with the task of raising funds and bringing together an interdisciplinary consortium including bioengineering, mathematical modeling, cell engraftment strategies, scaffold development, cell therapy *ex vivo* and in *vivo* models, and pharmacological regenerative approaches, able to enhance existing methodologies and develop new techniques for regenerative medicine therapies.

4 Workplace relations

4.1 Collaboration with the community

- School
  - Collaboration projects with primary/secondary/upper secondary school and post-secondary education. None
- Authorities
  - Collaboration with authorities and positions of trust.
    - DFG (Deutsche Forschungsgemeinschaft, Germany). Domain: Organ and Tissue Transplantation (2002-2006)

- Wellcome Trust (UK). Domain: Regenerative Medicine (2008-present)
- Italian Association for Research in Cancer (Italy). Domain: Experimental cancer research (2007-2008)
- EU evaluator FP7 (EU, Brussels). Domain: Regenerative medicine and organ transplantation (2010-2013)
- EMEA (European Medical Agency). Domain: Stem cell and tissue engineering for end-stage lung diseases (since 2009)
- ASPEN Institute Italia, Milan, Italy (since 2009)
- European postgraduate school of Cardiothoracic surgery
- Clinical Advisory Board, Technology and Innovation Center (http://www.innovateuk.org/content/news/new-cell-therapy-technology-and-innovation-centre.ashx)
- Clinical Advisory Board, Technology Strategy Board (UK funding agency for industry) - http://www.innovateuk.org/

- Media
  - Journalistic experience, editorial work etc.
    - Documentary about Stem cells organ transplantation by James Cameron, producer of Avatar

    - The Times. Claudia Castillo gets windpipe tailor-made from her own stem cells. http://www.timesonline.co.uk/tol/life_and_style/health/article5183686.ece 19November, 2008
    - BBC. Windpipe transplant breakthrough. http://news.bbc.co.uk/2/hi/7735696.stm 19 Nov 2008
    - The Guardian. Transplant first a giant leap for surgery. http://www.guardian.co.uk/society/2008/nov/19/stem-cell-transplant-claudio-castillo 19 Nov 2008
    - The Daily Star. First trachea transplant without drugs. http://www.thedailystar.net/newDesign/news-details.php?nid=64345 22 Nov 2008
    - The Times. New model humans. The transplant of a windpipe built from stem cells shows we are entering a new era of sci-fi medicine. http://www.timesonline.co.uk/tol/news/science/article5213509.ece 23 Nov 2008
    - The Guardian. Boy's windpipe replaced in pioneering stem cell operation. http://www.guardian.co.uk/science/2010/mar/19/boy-windpipe-replaced-stem-cells 19 March 2010
    - The Times. 'Milestone moment' as boy undergoes transplant to regenerate trachea. http://www.timesonline.co.uk/tol/news/uk/health/article7068514.ece 20 March 2010
    - The Washington Times. Doctors: Transplant advance in windpipe cancer http://www.washingtontimes.com/news/2010/jul/30/doctors-transplant-advance-in-windpipe-cancer/ 30July 2010
    - Abc News. Stem Cell-Engineered Windpipe for Cancer Patients http://abcnews.go.com/Health/Health/successful-stem-cell-trachea-transplant/story?id=11308383 2 Aug 2010

- Singolarity Hub. Woman Speaks With Her Own Voice After Larynx Transplant http://singularityhub.com/2011/01/22/woman-speaks-with-her-own-voice-after-larynx-transplant-video/ 22 Jan 2011
- The Washington Times. Sweden hospital in lab-made windpipe transplant. http://www.washingtontimes.com/news/2011/jul/7/sweden-hospital-in-lab-made-windpipe-transplant/ 7 Jul 2011
- The Washington Times. Doctors use lab-made windpipe in transplant. http://www.washingtontimes.com/news/2011/jul/7/doctors-use-lab-made-windpipe-in-transplant/ 7 Jul 2011
- BBC. Surgeons carry out first synthetic windpipe transplant. http://www.bbc.co.uk/news/health-14047670 7 July 2011
- CBC News. Windpipe transplanted from man's own stem cells. http://www.cbc.ca/news/story/2011/07/07/windpipe-transplant-stem-cell.html 7 Jul 2011
- CNN. Lab-Made Organ Implanted For First Time http://www.thedenverchannel.com/health/28476214/detail.html 7 Jul 2011
- USA Today. Lab-grown windpipe saves cancer patient http://www.usatoday.com/NEWS/usaedition/2011-07-08-windpipe_ST_U.htm 7 Jul 2011
- abcNews. Sweden Hospital in Lab-Made Windpipe Transplant. http://abcnews.go.com/Health/wireStory?id=14020120 7 Jul 2011
- BBC News. First synthetic organ transplant. http://www.bbc.co.uk/news/health-14068012 7 Jul 2011
- NPR.org. Cancer Patient Gets First Totally Artificial Windpipe. http://www.npr.org/blogs/health/2011/07/20/137701848/cancer-patient-gets-first-totally-artificial-windpipe 8 Jul 2011
- LifeNews.com. Adult Stem Cells Help Create New Windpipe, Save Cancer Patient http://www.lifenews.com/2011/07/08/adult-stem-cells-help-create-new-windpipe-save-cancer-patient/ 8 Jul 2011
- The Wall Street Journal. Lab-Made Trachea Saves Man http://online.wsj.com/article/SB10001424052702304793504576432093996469056.html?KEYWORDS=macchiarini 8 Jul 2011
- Business&Health Cancer patient saved by first-ever synthetic organ transplant. http://www.ibtimes.com/articles/176700/20110708/transplant-windpipe-karolinska-sweden-surgeons-cancer-stockholm-organ-trachea.htm 8 Jul 2011
- BdNews. First synthetic organ transplant in Sweden. http://bdnews24.com/details.php?id=200341&cid=2 8 Jul 2011
- The Times Tribune. Lab-made windpipe used in transplant. http://thetimes-tribune.com/news/health-science/lab-made-windpipe-used-in-transplant-1.1172904?localLinksEnabled=false#axzz1VkRKpoCs 9 Jul 2011
- The Hindu. Hospital in Sweden performs lab-made windpipe transplant http://www.thehindu.com/news/international/article2211776.ece 9 Jul 2011

- The Telegraph. First transplant of a fully synthetic organ carried out. http://www.telegraph.co.uk/health/healthnews/8624053/First-transplant-of-a-fully-synthetic-organ-carried-out.html 22 August 2011
- The Telegraph. British doctors help perform world's first transplant of a whole organ grown in lab. http://www.telegraph.co.uk/health/healthnews/3479613/British-doctors-help-perform-worlds-first-transplant-of-a-whole-organ-grown-in-lab.html 22 August 2011

- Community
  - Participation in exhibitions and popular science events addressed to the general public. None
- Commerce and industry
  - Industry funding:
    - Effects of thymostimulin on chemotherapy-induced toxicity and long-term survival in small cell lung cancer (Serono Spa, 1985-1990: 35.000 €).
    - Phase II studies of high-dose epirubicin in patients with small cell lung cancer. (Farmitalia Spa, 1985-1990: 70.000 €).
    - Experimental and clinical evaluation of a new synthetic, absorbable sealant to reduce air leaks in thoracic surgery. (Focal Inc., USA, 1995-1997: 80.000 $).
    - Hyperthermic (41ºC) isolated lung perfusion with high-dose of cisplatin for the treatment of surgically relapsing or unresectable lung sarcoma metastasis. (Bristol-Meyers grant, D, 2001-2004: 45000 €).
    - Perioperative Infection prophylaxis in elective lung surgery: prospective study with Rocephin versus retrospective control-analysis with aminopenicillin-Betalactamase-inhibitor-combination. (Roche Holding, 2002-2005: 5.000 €).
    - Feasibility Study of a novel vascular access mode for artificial lung. (Novalung GmbH, 2005: 45.000 €).
    - Caracterización cellular y extracelular de la disfunción endotelial en la hipertensión pulmonar crónica post-embólica. (MAPFRE reserach grant, 2006: 13.200 €).
    - Feasibility Study of a novel treatment for postpneumonectomy ARDS. (Novalung GmbH, 2006: 45.000 €).
  - Industrial collaborations with established companies (scientific, assignments, consultation, other)
    - Harvard Bioscience (www.harvardbioscience.com, USA)
    - Nanofibers Solution (www.nanofibersolutions.com, USA)
    - Novalung GmbH (www.novalung.com, Germany)

4.2 Committee work

This section documents:

- Work in committees, authorities and boards at local, national and international level.
    - Comittees:
        - Chairman, Research and Research Funding, European Association Cardio-thoracic Surgery (EACTS)
        - Scientific Council on Pulmonary Transplantation, International Society of Heart-Lung Transplantation
        - European Union Liaison, EACTS
        - Post-graduate Education, EACTS
        - Young Investigator Awards, EACTS
        - Hans Borst Award Committee, EACTS
        - Surgical Treatment of End-Stage, Cardiopulmonary Disease Committe, Society of Thoracic Surgeons
    - Authorities and boards:
        - DFG (Deutsche Forschungsgemeinschaft, Germany). Domain: Organ and Tissue Transplantation (2002-2006)
        - Wellcome Trust (UK). Domain: Regenerative Medicine (2008-present)
        - Italian Association for Research in Cancer (Italy). Domain: Experimental cancer research (2007-2008)
        - EU evaluator FP7 (EU, Brussels). Domain: Regenerative medicine and organ transplantation (2010-2013)
        - EMEA (European Medical Agency). Domain: Stem cell and tissue engineering for end-stage lung diseases (since 2009)
        - ASPEN Institute Italia, Milan, Italy (since 2009)
        - European postgraduate school of Cardiothoracic surgery
        - Clinical Advisory Board, Technology and Innovation Center (http://www.innovateuk.org/content/news/new-cell-therapy-technology-and-innovation-centre.ashx)
        - Clinical Advisory Board, Technology Strategy Board (UK funding agency for industry) - http://www.innovateuk.org/
- Positions of trust within academic organisations. None
- Student union activity. None

4.3 Active work on ethical issues, equal opportunities, the workplace environment and environmental questions

This section documents work on ethical issues, equal opportunities, the workplace environment and environmental questions.

All these were obligatory duties that Dr. Macchiarini had during his postion as Chairman of the:

- Department of General Thoracic Surgery Hospital Clinic, University of Barcelona, Barcelona (Spain). From 01/2005 to 12/2009;

- Medical Director, Heidehaus Hospital, Hannover Medical School, Hannover (Germany). From 1/2003 to 12/2004;
- Department of General Thoracic and Vascular Surgery, Heidehaus Hospital, Hannover Medical School, Hannover (Germany). Between 04/1999 and 12/2004.