

Mauro Merli

IMPLANT THERAPY

The Integrated Treatment Plan



Milan, Berlin, Chicago, Tokyo, Barcelona,
Istanbul, London, Moscow, New Delhi, Paris,
Prague, São Paulo, and Warsaw

COMING TOGETHER IS A BEGINNING. KEEPING TOGETHER IS PROGRESS...
WORKING TOGETHER IS SUCCESS.

Henry Ford

Acknowledgments

For years I have embraced the idea of creating a work stemming from the knowledge and experience that I have acquired while managing and treating complex clinical cases with an interdisciplinary approach where dental implants play a leading role.

This experience has taught me the importance of exchanging ideas with both younger colleagues, fresh from academic environments, and more mature professionals, whose cultural background and clinical expertise have given them ongoing enthusiasm for our discipline. Thus, this awareness led me to select a versatile editorial committee, without which this first volume would never have materialized.

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Left to right: M. Bonfini, E. Bianchini, G. Mariotti, M. Merli, U. Pagliaro, H. Dawe, M. Moscatelli, E. Botton.

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Foreword

It is a great pleasure to present Dr Mauro Merli's book, *Implant Therapy: The Integrated Treatment Plan*. Thanks to the rigor with which it was structured, and in keeping in line with the current medical philosophy of evidence-based medicine founded on methodologically correct scientific information acknowledged by the international scientific community, this text fills a void in modern dental literature. For the first time, we find a book that is meticulous in classifying quotations and bibliographic references, making it easy for the reader to identify at a glance which information is reliable and to recognize which is the fruit of personal opinions or tests of questionable reliability. This professional approach is even more important in the field of dental implants, which by nature often lends itself to conflicting controversial interpretations and in which business considerations can have an impact on clinical practice.

A further point of interest is how Dr Mauro Merli stresses throughout this work the importance of the patient, who in the current view of modern medicine is placed more and more at the heart of all therapeutic treatment. From a broader perspective, not limited to a mere technical-surgical approach, the author assesses all the systemic conditions which may in any way limit implant therapy. The significance of this complete evaluation of the patient also emerges from the medical approach, with a multidisciplinary team including not only the operator and auxiliary staff but also the key figure of the anesthesiologist monitoring all clinical parameters both during routine treatment and, more relevantly, in risk situations that more complex procedures may cause.

Diagnosis, a fundamental prerequisite for forming an interdisciplinary treatment plan, is illustrated accurately and thoroughly with reference to new technologic sophisticated devices, such as the more and more commonly used cone beam computed tomography, which provide details that until now have not been dreamed of and yet are now absolutely necessary to locate suitable implant sites and key anatomical features.

The chapters illustrating implant prosthetic therapy through the presentation of cases, technical and surgical details, and practical solutions are as beautiful and refined as can be seen today in hard tissue reconstruction and sophisticated soft tissue management, which is hardly surprising given the undeniable skill and mastery of the author and his team.

Particular importance is given to the coverage of implant and prosthetic complications, also serving as an ethical reminder to our profession. The statistical information recorded subdues the temptation—too often encountered—to be carried away by overenthusiasm, reminding the reader that failure is not uncommon and that a successful outcome may not last forever, despite the glowing results frequently reported. Hence, especially when dealing with a complex case, it is important to predict the risk of failure and consequently to plan cautiously and thoroughly in order to achieve lasting success.

The entire book contains excellent illustrations, diagrams, and explanatory tables, together giving a wealth of information that makes it essential reading for both novices and all those who wish to practice correct implant treatment based on a solid scientific basis. It is my opinion that its readability and didactic approach also make it remarkably suitable as background material for dentistry undergraduates. I am certain that this work will be eminently successful and will reward the author for his considerable investment of time and energy. I convey sincere congratulations to Dr Mauro Merli and all his staff, and my sincere praise goes to Quintessenza Edizioni for the splendid editorial presentation.

Giovanpaolo Pini Prato

Foreword

The text *Implant Therapy: The Integrated Treatment Plan* stems from Dr Mauro Merli's more than two decades of cultural and professional experience and is the fruit of over two years' synergic efforts by an editorial group which I have had the pleasure and honor of coordinating. With the wholehearted agreement of all concerned, the underlying spirit of the publication was established from the outset; first of all, attention to and respect for the intricacy of the patient-subject as a whole, viewed as an individual in his or her personal sociocultural context; simultaneously, an awareness of not only the greater potential of the diagnostic and treatment tools which scientific research has made available to the field of medicine and surgery but also the advent of new skills which health care practitioners must consequently master. These two opposing poles, the patient-subject and the clinician—each with their specific features—work together toward achieving a successful integrated treatment plan outcome and long-term stability and well-being. Compliance by all to the most recognized scientific evidence further guarantees the result.

Starting from this mission statement, it was decided that all the contents would be constantly supported by the relevant literature. The use of a color legend grading system to classify the scientific data by assigning a score for each reference to treatment required an immense additional effort, which we deemed worthwhile due to its dual purpose. Not only does the color coding provide the reader with more instant comprehension, but it also serves to gradually promote independent critical awareness.

The commitment to weighing the proof used to support statements involved the entire editorial team and encouraged debate, delving into the various aspects of each issue, development of new ideas, sharing of assignments, shouldering of responsibilities, consolidating mutual respect and friendship, and—above all—engaging in a conscientious application of a systematic approach to doubt and uncertainty (or, rather, the probability of certainty), leading to the most appropriate decisions.

"We need to learn to sail in an ocean of uncertainties through archipelagos of certainty," suggests Edgar Morin (*Seven Complex Lessons in Education for the Future*, UNESCO, 1999). The editorial team was the vessel that carried us on our voyage of learning, with the awareness—today more than ever before—that research requires a team comprising specific competencies and their coordination.

It was November 2008 when Mauro Merli, with his characteristic exhilarating enthusiasm, outlined his project for this book. Now that I have seen the mission accomplished, I owe him my thanks for having given me this important opportunity for professional and personal growth.

Umberto Pagliaro

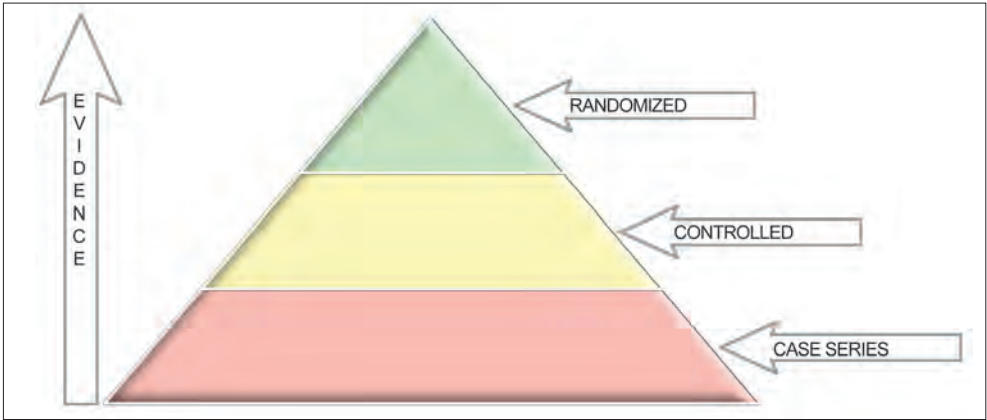
Explanation of the Dental Literature Grading System

The reader will come across many affirmations throughout this text, accurately supported by up-to-date research as published in scientific articles. The bibliographic references found at the end of each chapter constitute a “book within a book” for those who wish to further their knowledge on the various subjects.

A number of other statements, however, are not supported by biomedical literature and should be read as opinions stemming from common sense combined with decades of clinical experience and which are not in conflict with currently available scientific evidence.

Results of biomedical as well as scientific research are generally the backbone of a cultural and clinical approach to the profession, which should be first and foremost viewed as a service to the patient being treated. Information gathered scientifically provides the practitioner with reliable and valuable information during diagnosis and therapy and serves as a guarantee to the patient-individual that the correct choices have been made in the treatment plan (evidence-based medicine) (Sackett et al 2000). Any type of research reported in a scientific article may be affected by systematic error or so-called bias. Depending on the quality and quantity of bias present, reliability classifications or scales may be elaborated to assess the types of studies published in literature, thus creating a grading system (*Journal of Evidence-Based Dental Practice* 2009). This permits all types of scientific articles to be assigned a tier in an idealized pyramid, ranging from the lowest level for studies with a greater number of systematic errors and less evidence to the highest in which there is less bias and greater strength of scientific proof (Fig 1).

Fig 1 Pyramid grading system of types of scientific articles.



Different grading systems are indicated according to their application, whether during diagnosis, treatment, or prognosis. Box 1 illustrates the treatment-oriented grading system for different types of study proposed by the *Journal of Evidence-Based Dental Practice*, adapted to give the reader a clearer overall view (Newman et al 2007).

BOX 1 Grading system according to the *Journal of Evidence-Based Dental Practice*

GRADE 1
Good-quality evidence Main feature: Inclusion of RANDOMIZATION Systematic review and meta-analysis of randomized controlled trials (RCT) High-quality RCT
GRADE 2
Limited-quality evidence Main feature: Inclusion of CONTROL Systematic reviews of nonrandomized studies Controlled prospective studies Controlled retrospective studies
GRADE 3
Extremely limited-quality evidence Main feature: Lack of control Case series Case reports Expert opinion

All scientific articles on treatment referred to in this work will be labeled with a specific reference to their level of scientific evidence according to the grading system described above. This will be done with a “traffic light” color code as follows:

- **GRADE 1 (green):** Awarded for a high degree of evidence due to the randomization factor (high-quality systematically reviewed randomized controlled trials [RCT] and systematic reviews of RCTs).
- **GRADE 2 (yellow):** For limited evidence where control takes place without randomization, such as controlled retrospective studies, controlled prospective studies, and systematically reviewed nonrandomized studies.
- **GRADE 3 (red):** For a low degree of evidence lacking the case-control element, such as expert opinions, case reports, and case series.

Therefore, the different types of study or trial briefly described below are allocated their respective tiers in ascending order on this grading system.

- **EXPERT OPINIONS (red).** Published by acknowledged experts on specific subject matter. At best these may provide clinical suggestions, but definitely not proof. A clinical suggestion may, however, give the impetus for new studies of a specific and methodologically detailed nature, which may in the future validate the original idea.
- **CASE REPORTS (red).** Studies conducted on one case or a limited number of cases in which a particular procedure has been applied or in which a particular behavior has been observed. Case reports offer limited proof due to the absence of a control group, a lack of an inferential statistic, or the possibility of contamination by a conspicuous number of systematic errors. They may offer useful indications, but these must be approached with caution, because they lack validation through trials incorporating stricter methodologic criteria.
- **CASE SERIES (red).** These studies are more detailed than the previous and take into consideration a greater number of subjects in whom a particular behavior has been observed or who have undergone a particular treatment.

- **RETROSPECTIVE CONTROLLED STUDIES (yellow).** The group of individuals taking part in the study is chosen after the treatment has been done. Also known as *historic studies*, they compare, for example, individuals who have received an intervention with others who have not or who have followed an alternative therapeutic plan. The groups compared in retrospective studies are seldom homogenous.

- **PROSPECTIVE CONTROLLED or COHORT STUDIES (yellow).** The group of individuals taking part in the study is recruited according to a selection protocol established prior to commencement of the study. An example may be a study on two groups of patients who are subjected to two different techniques in order to assess which gives a better outcome. The fact that an operative protocol is established prior to the event and that there is a control group gives this type

of study greater scientific value than those described above. The case selection element is of relevance in terms of outcome: In a retrospective study, analysis of data takes place after the efficacy of a particular therapy is already known, unlike a prospective study in which this information is not yet available. Furthermore, a set of previously established criteria for inclusion and exclusion ensures that the sample in prospective studies is more accurate and homogenous. On the other hand, cohort studies have one major shortcoming: The participants are not chosen on a random basis, and consequently, the same operator decides (by chance) which technique to apply for each individual case tested.

• **RANDOMIZED CLINICAL TRIALS (RCT) (green).** Studies with a high degree of scientific proof thanks to the introduction of randomization: The participants are allocated to different treatment groups through random selection methods. These include simple, blocked, and stratified randomization (Altman et al 2001). In addition to randomization, RCTs have a number of distinguishing features (Shulz et al 2010, Moher et al 2010):

- *Blinding.* Neither the researchers nor the trial participants must know the procedure being carried out, in order to avoid favoring one therapy over another. Although this is not always possible, especially when the trial involves surgical procedures, in an ideal situation an RCT should mean blinding of all parties: operator, patient, outcome assessor, and statistician.
- *Allocation concealment.* The randomization list must remain concealed until the moment that therapy is administered. This can be obtained with various methods, such as utilizing sealed envelopes containing indications regarding the therapy the patient is to follow.
- *Reliability of measurement testing.* Prior to commencing the study, it is necessary to assess reliability of the operators responsible for measuring the outcome.
- *Multicentering.* The efficacy of therapy is often based on the experience and ability of the operator applying it. In order to study the variables associated with an individual operator's skill, a multicentric study must be carried out where more than one operator uses the same technique to treat a specific situation.
- *Sample size calculation.* The trial must study a sufficient number of subjects in order to reach a level of statistical significance. A study encompassing a congruous number of recruits will have greater impact.
- *Allowance for drop-outs.* Patients in whom therapy has resulted in failure may abandon the study with less difficulty. This could create a bias, leading to an overestimation of the results of the therapy. Therefore, the number of subjects dropping out and reasons for dropping out of the study should be reported.

• **SYSTEMATIC REVIEWS OF RCTs (SR of RCT) (green).** Providing that they are properly conducted from a methodologic point of view, these studies provide the highest level of scientific evidence. Where the trials contemplated within the systematic review are of a similar nature, a meta-analysis may be performed to suitably collate and weigh the results of all the trials.

Because this book also refers to a good number of **EXPERIMENTAL TRIALS**, a further color code *(blue)* has been added to classify these trials but not the treatment grading system, which refers to clinical trials alone. Experimental trials are conducted on animals or in a laboratory but not on humans, and their purpose is to validate specific procedures or instruments or to observe the cascade of events following a specific procedure.

By paying careful attention to the color code accompanying all bibliographic references referring to therapy, the reader will gain a dual benefit. The first is an immediate guide among the literature listed and an indication of the strength of recommendation, while the second will be a growing awareness and development of a critical perspective to apply independently when dealing with the ever-increasing quantities of scientific data at our disposal.

Color legend:

- ▲ Systematic reviews of randomized controlled trials
- ▲ Randomized controlled trials
- ▲ Systematic reviews of controlled studies
- ▲ Controlled prospective studies
- ▲ Controlled retrospective studies
- ▲ Case series
- ▲ Case reports
- ▲ Expert opinion
- ▲ Experimental studies on animals
- ▲ Studies conducted in laboratories

References

- Altman DG, Schulz KF, Moher D, et al. The revised CONSORT statement for reporting randomized trials: Explanation and elaboration. *Ann Intern Med* 2001;134:663–694.
- Moher D, Hopewell S, Schulz KF, et al. CONSORT 2010 explanation and elaboration: Updated guidelines for reporting parallel group randomised trials. *BMJ* 2010;340:c869.
- Newman MG, Weyant R, Hujoel P. JEBDP improves grading system and adopts strength of recommendation taxonomy grading (SORT) for guidelines and systematic reviews. *J Evid Based Dent Pract* 2007;7:147–150.
- Sackett DL, Straus SE, Richardson WS, Rosenberg W, Haynes RB. *Evidence-Based Medicine: How to Practice and Teach EBM*, ed 2. Edinburgh: Churchill Livingstone, 2000.
- Schulz KF, Altman DG, Moher D, CONSORT Group. CONSORT 2010 statement: Updated guidelines for reporting parallel group randomised trials. *BMJ* 2010;340:c332.

Introduction



Over the recent decades we have witnessed a profound transformation in the way treatment plans are conceived and implemented, especially with complex clinical cases. One of the main changes concerns the importance we give to the specific needs and wishes of the patient-individual who entrusts the clinician with the health of his or her oral cavity.

Indeed, we have gone from an “ideal” treatment plan in which the illness was at the center of the therapeutic process (disease-centered medicine), to a treatment plan considered to be “the most appropriate” for the individual patient, who with unique, multifaceted traits is the focal point of our efforts (patient-centered medicine) (Brown et al 1986, Levenstein et al 1986, Stewart et al 1986). This shift in the paradigm was influenced by the evolution of the way “health” is actually perceived. At first, *health* was indeed defined as “not merely the absence of disease or infirmity” but mainly as “a state of complete physical, mental, and social-economic well-being” (Constitution of the World Health Organization [WHO] 1948).

Since then, the definition of *health* has come to encompass the person and his or her overall degree of satisfaction, becoming the core around which all other factors converge. In this context lies the assumption commonly held today that health, rather than a static condition, is a dynamic process largely influencing our way of life: “A well-informed, well-motivated and actively participating community is a key element for the attainment of the common goal” (WHO 1985). It follows that oral, dental, and implant therapy should also play its role by favoring patient participation and contributing to the individual’s quality of health and life (Locker 1998 ▲).

Based on this new approach, an appropriate treatment plan can be created and proposed only through thorough understanding of the patient’s overall profile, taking into consideration the complexity of the person. This implies an analysis and assessment of the patient’s psychologic and socio-economic profile as well as clinical conditions and prognosis. Equally essential is to determine his or her degree of satisfaction, to record adverse events and complications, and to provide a cost-benefit analysis.

An in-depth evaluation will show how these new requirements call for a re-evaluation of the entire diagnostic and therapeutic process in the direction of an “integrated treatment plan” which promotes not only interaction between the specialties involved to ensure treatment supported by quality scientific evidence but also the patient’s active participation. In other words, the very existence of an integrated treatment plan relies on the professional team’s interdisciplinary synergy and on a strategic alliance between clinician and patient, working toward patient-centered medicine as indicated by Brown et al (1986), Levenstein et al (1986), and Stewart et al (1986, 1995 ▲, 2003) and as declared by the 31 March 2005 Florence Charter for Doctor-Patient Relationships (Carta di Firenze 2005, Società Italiana di Farmacologia 2009).

This concept clearly reflects the perspective of this book’s approach to the treatment of individuals with a greater or lesser degree of edentulism who request complex rehabilitation by means of implant-supported dentures, one of the most important innovations of the recent decades in the field of dentistry. Numerous prospective clinical trials, conducted along rigorous protocols and published in the world’s leading scientific journals, have demonstrated high rates of implant survival and overall success with patients who are partially edentulous in esthetic areas. On the other hand, it is apparent that a positive outcome is directly dependent on meticulous application of diagnostic, surgical, and prosthetic procedures that have previously been tested and found both effective and efficient by the scientific community.

Recent literature on implant prosthetic treatment, however, indicates that the same scientific community is adopting almost unanimously the requirements and beliefs of patient-centered medicine. The most current and highly qualified research and publications stress more and more frequently the importance of assessing the results of implant-based oral rehabilitation through properly randomized clinical trials and use of variables centered on the patient’s opinion and on the changes in his or her quality of life. In other words, the variables traditionally taken into consideration, although scientifically relevant, are no longer sufficient to provide the 360-degree perspective required (Locker 1998 ▲). For example, a meta-analysis published in 1998 by Lindh et al (▲) conducted on a series of both prospective and retrospective studies showed that at a 6-

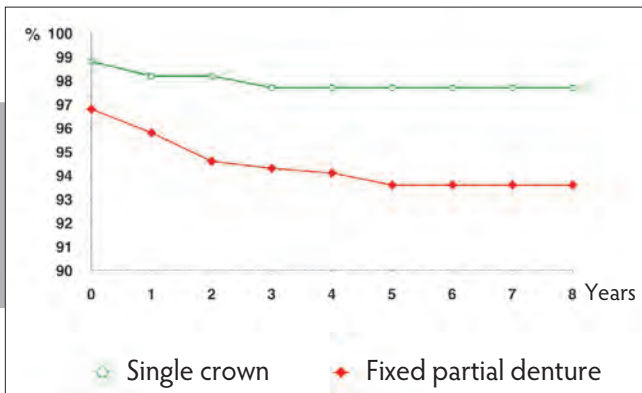


Fig 1 Percentages of implant survival in partially edentulous patients.

to 7-year follow-up from the application of the definitive prosthesis, implants with single crowns guaranteed a 97.5% survival rate compared with 93.6% for implant-supported partial dentures (Fig 1).

Generally speaking, the implant-based rehabilitation success evaluation criteria in the studies selected for the meta-analyses were:

- Achievement of osseointegration
- Long-term stability of the prosthetic rehabilitation
- Long-term stability of marginal bone height
- Percentage of implant survival

Although these criteria are still the most commonly found in scientific literature assessing the performance of dental implants, including those in areas of esthetic interest, they fail to take into consideration the additional principles stated above, namely those of patient-centered medicine and quality-of-life matters.

The clinical case illustrated in Figs 2 to 4 is an emblematic example: If we assess the outcome purely in terms of the parameters listed above, it could be considered a success. Instead, it is evident that results of a complication (membrane exposure) occurring during healing of the guided bone regeneration actually led to an extraordinary failure.

Fig 2 Clinical view 3 weeks after posttraumatic avulsion of the maxillary left central and lateral incisors. (a) Frontal view. (b) Occlusal view.



Fig 3 Two implants inserted with simultaneous guided bone regeneration. (a) Exposure of the alveolar bone. (b) Insertion of two endosseous implants in the maxillary left central and lateral incisor positions. (c) Placement of nonresorbable expanded polytetrafluoroethylene (e-PTFE) membrane. (d) Closure of surgical flaps.

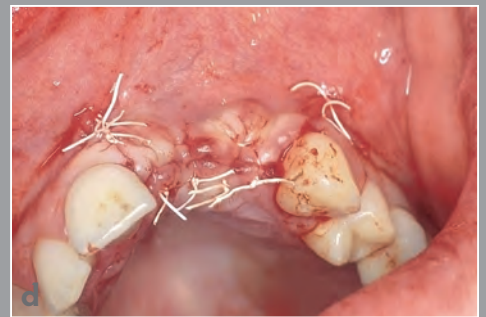
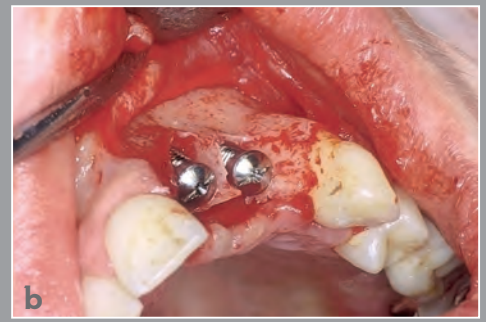


Fig 4 Unsatisfactory healing outcome 6 months later as a result of early exposure of the membrane and placement of the provisional restoration.

This clinical case illustrates the importance, especially in esthetic areas, of integrating traditional implant performance assessment with at least the following additional success criteria:

- Harmony of the prosthesis with the surrounding intra and extraoral structures
- Harmony of peri-implant tissues
- Long-term stability of peri-implant soft tissue
- The patient's degree of acceptance from a psychological perspective
- The patient's degree of subjective satisfaction

It is highly probable that rigorous application of the above parameters would considerably reduce the percentages of implant success described in literature. With the knowledge and techniques now available, it is possible to achieve such a high dentofacial esthetic integration of implant-based restorations as to appear genuinely natural, in harmony with the adjacent anatomy. As we continue through the chapters of this book, we shall in fact see how many diagnostic, surgical, and prosthetic procedures have been proposed over a relatively short number of years, all contributing significantly to the achievement of this goal.

The principal aim of this text is precisely to illustrate how we, in our daily routine practice, treat candidates for implant placement in an area of esthetic and/or functional interest. We therefore start by assessing the potential risk factors, delving into the process of constructing a diagnosis, and then describing step-by-step some of the more recent surgical procedures. The second volume deals with prosthetic solutions for varying degrees of edentulism and a programmed treatment system designed to maintain the results achieved in an improved long-term prognosis. Lastly, the importance of being equipped to face biologic and biomechanical complications will be addressed and illustrated, supported by an in-depth analysis of a number of complex clinical cases.

Each phase covered will be accompanied by clear references to its scientific background in order to provide the reader with bibliographic support for further study.

In the belief that sharing ideas, comparing experiences, and spreading information can surely contribute to professional growth and improvement, this text has been written not only for dentists or oral health experts but also to reach students, practitioners—whether general or specialist—and all other health care professionals.

Color legend:

- ▲ Systematic reviews of randomized controlled trials
- Randomized controlled trials
- ▲ Systematic reviews of controlled studies
- Controlled prospective studies
- Controlled retrospective studies
- ▲ Case series
- Case reports
- Expert opinion
- ▲ Experimental studies on animals
- Studies conducted in laboratories

References

- Brown J, Stewart M, McCracken E, McWhinney IR, Levenstein J. The patient-centred clinical method. 2. Definition and application. *Fam Pract* 1986;3:75–79.
- Carta di Firenze. Firenze, 31 March 2005. http://sif.unito.it/dei_onlus/carta_firenze_dei-onlus.pdf. Accessed 4 December 2009.
- World Health Organization. Constitution of the World Health Organization. http://www.who.int/governance/eb/who_constitution_en.pdf. Accessed 18 November 2011.
- Levenstein J, McCracken E, McWhinney IR, Stewart M, Brown J. The patient-centred clinical method. 1. A model for the doctor-patient interaction in family medicine. *Fam Pract* 1986;3:24–30. ▲
- Locker D. Patient-based assessment of the outcomes of implant therapy: A review of the literature. *Int J Prosthodont* 1998;11:453–461. ▲
- Società Italiana di Farmacologia (SIF) e “Fondazione DEI-Onlus”. Carta di Firenze. I componenti del gruppo di lavoro. http://sif.unito.it/dei_onlus/carta_firenze_dei-onlus.pdf. Accessed 4 December 2009.
- Stewart M. Effective physician-patient communication and health outcomes: A review. *CMAJ* 1995;152:1423–1433. ▲
- Stewart M, Brown J, Levenstein J, McCracken E, McWhinney IR. The patient-centred clinical method. 3. Changes in residents’ performance over two months of training. *Fam Pract* 1986;3:164–167.
- Stewart M, Brown J, Weston WW, McWhinney IR, McWilliam CL, Freeman TR. *Patient-Centered Medicine: Transforming the Clinical Method*, ed 2. Abingdon, UK: Radcliffe Medical, 2003.
- World Health Organization Regional Office for Europe. *Targets for Health for All: Targets in Support of the European Regional Strategy for Health for All*, vol 16. Copenhagen: World Health Organization Regional Office for Europe, 1985.