Aftercare of the contact lens wearing patients is very difficult without an adequate means of evaluating change. Descriptive terms, as used by most practitioners, to record slit-lamp observations allow flexibility for the variety of clinical presentations. Analysis of clinical observations, the evaluation of changes in ocular structure or condition after contact lens wear, is difficult with only qualitative terms. Semantic (language dependent) difficulties inherent in, often highly individualistic and stylistic, qualitative patient records, may result in poor interpretation of clinical findings at aftercare. Combined with the lack of systematic recording of observations, inappropriate clinical decision making may result.

Quantitative (numerical) records are important for experimental and clinical analysis, to avoid these problems. Routine use of a grading system for clinical data collective allows for greater reliability (same result for the same observation), is systematic (logical ordering of observations), semantically independent (not subject to the same degree of interpretation), and analytical (allow quantitative assessment of change at subsequent examination). A recording system is proposed which, when used in conjunction with clinical diagrams, lends itself to simplicity, yet high information content, to enhance and aid clinical decision processes.

It is important to keep logical, intelligible patient records, which detail all procedures, results and management decisions. Ethically the practitioner must act in the best interest of the patient, and good aftercare of contact lens patients is very difficult without an adequate means of evaluating change. In addition, patient records are legal documents, and in the event of a case of negligence, a procedure not recorded, in the eyes of the law, was not performed. Taylor and Austen (1986) outline the “minimum contents” and “essential elements” of case records.

Slit lamp observations in contact lens practice are those of the anterior eye and contact lens, but the topics discussed here can be generalised to many aspects of optometric and ophthalmic practice. Aftercare of the contact lens patient may be considered the assessment and management of ocular and contact lens condition after commencement of wear. The General Optical Council requires that practitioners provide “adequate continuing aftercare and supervision” (Notice N.22).

Supervision requires patient management decisions involving clinical assessment of change, which can only be made with sufficient information regarding the previous ocular and contact lens condition. Management includes: regular monitoring; alterations in wearing schedule, lens maintenance regimen or fitting philosophy; and medical intervention.

Many practitioners recording slit-lamp observations use descriptive or qualitative terms. Qualitative terms are very flexible and allow the practitioner to cope with the wide variety of clinical presentations. The inherent difficulty, however, is that such recording is dependent upon the vagaries of language. Words are semantically ambiguous—various interpretations may be made of the same word, both in time and between practitioners, leading to difficulties of interpretation at subsequent examination of the patient. The use of qualitative terms can be highly subjective, resulting in poor reliability. In addition qualitative records are non-systematic, and therefore not in a form which can be used readily for data collection or analysis. Analysis includes normal aftercare of a contact lens patient in the evaluation of changes in structure or condition. Information collected in this form cannot be used within an experimental context as the data cannot be entered into a computer and used for analysis or calculation.

A quantitative recording system offers many advantages, including simplicity. Although modifying established procedures may not strike the experienced practitioner as a ‘simple matter, I shall endeavour to demonstrate the benefits and ease of applying such a system. Quantitative recording of clinical findings is more reliable, systematic (i.e. logically orders observations), semantically independent and analytical,
and hence aids in the decision making process.

The capacity to produce repeatedly the same result given the same clinical observation, condition or test can be termed the reliability of the procedure. Ideally a procedure should show reliability across time and between practitioners, so that all practitioners would record the same observation at all times given the same presentation. Wood, Hill and Reeves (1988) have shown that even tests such as visual acuity (considered a stable attribute by many practitioners) have limited reliability.

Terms to describe the corneal endothelial appearance might include “smooth”, “flat”, “regular”, “bumpy”, “irregular”, or “rough”. Any such description is limited to the practitioner’s vocabulary. Semantic difficulties may arise as practitioners will have different interpretations of these terms. Perceptions and interpretations can also vary with experience and time. For example, the perception of patients seen in private practice may change after commencing sessional work in a hospital contact lens department. Similarly, neovascularisation within the visual axis of a previous patient may influence a practitioner’s judgement of the severity of 15mm invagination into a following patient’s cornea. Over time, words in society undergo semantic changes (often not so slowly, given the influence of today’s mass media), a process which can lead to subsequent misunderstanding. Descriptive entries viewed at a later date may then be misinterpreted. Qualitative terms also lack any systematic information. Corneal endothelial description, with terms such as those listed above, contains very little information as to the state of the endothelium which can be used to assess anything but the grossest changes in condition. In the worst case this could lead to failure to note a significant (but not drastic) alteration in ocular condition.

Management of the contact lens patient requires decision making which depends upon the ability to assess alteration in clinical observations (analyse data). This may be the clinical evaluation of a change from grade 2 to grade 3 contact lens induced papillary changes CLPC1 (Allansmith, 1988). Analysis of data is a clinical procedure, but the term is more frequently used to refer to experimental studies. This may, for example, involve an analysis of the proportion and grades of CLPC before and after a clinical trial of a new cleaning regimen (the treatment). Experimental studies cannot be performed adequately without quantitative data, as results which are not in a numerical format cannot be stored and analysed by computer.

The purpose of this paper is to propose a system of grading of clinical observations to aid in clinical decision making. Before that, a short discussion of number systems will be necessary. Number systems are hierarchical, with each higher order having all the characteristics of those below it. Nominal systems allow identification or classification, such species of tree or type of colour vision deficiency. Ordinal systems assign order or rank, for example military rank or grades of retinopathy. Interval scales allow familiar arithmetic functions, for example money or ophthalmometry (note that visual acuity, as commonly performed and recorded, is only ordinal, but that the use of the logMAR system, as proposed by Bailey and Lovie (1976), gives an interval scale). Ratio is the most complex number system, and as a ‘derived variable contains the most information. Examples include percentages and cup/disc ratio. Parametric systems (interval and ratio) can be handled with normal arithmetic transformations (e.g. addition or subtraction), and described with familiar statistical terms (e.g. mean, standard deviation). Non-parametric systems (nominal and ordinal) can only be transformed in a limited fashion. Identity or rank must be maintained i.e. multiplication and division but not subtraction or addition, for example a Naval captain is not equal to two lieutenants, and a change in CLPC from grade 0 to 2 is not equivalent to a change from grade 2 to 4. Special descriptive and analytical statistics are available for non-parametric variables (Siegel, 1976). Introductory statistical texts such as Miller (1984) or Sokal and Rohlf (1987) may be consulted for more detailed information.

Grading systems involve the categorisation of clinical observations and an interval scale based upon degree or severity of the observed condition. Grades are generally an advance upon simple descriptive reportage, as they are systematic, entail fewer semantic difficulties and allow comparison and computation. Whilst descriptive terms offer a greater degree of flexibility, scales carry more information, and more reliability, increasing the ability to detect clinically significant conditions (selectivity). However, poorly designed scales can be inflexible and lead to a loss of information. Information loss may occur if a balance is not struck between the practitioner’s ability to utilise the full extent and the degree of complexity of a grading system. There appears to be a limit to the number of grades which can usefully be employed. Information theory (Miller, 1956) suggests that reliability of categorisation decreases with more than five to seven separate grades, and is apparently dependent upon our memory store. At the other extreme, yes/no or on/off reports are simple, two-grade systems and obviously carry limited information. There are advantages to using scales of variable size for diverse clinical observations (e.g. ophthalmometry mire distortion, as opposed to the numerous types of corneal oedema), but a multiplicity of scales for different conditions can in itself lead to confusion. For the reasons above, it is proposed that a five-grade system be used for rating all slit lamp observations.

The difficulty with any grading system lies in the setting of the decision criteria. Disagreements in grading by different practitioners (intraobserver error) may be reduced by discussion prior to the implementation of the grading system. Reliability can be improved by independent grading of a large number of patients, comparison of each result, and discussion to eliminate differences. Further improvement can be obtained through the use of written criteria describing the appearance of each condition in each grade (for example

1. Otherwise known as GPC (Allansmith et al, 1977)
With many conditions photographic or diagrammatic descriptions can be employed for direct reference by the practitioner, also reducing interobserver errors (i.e. made by the same practitioner). These descriptions or scales offer the greatest level of reliability. The production of a set of internationally recognised visual (photographic) scales of clinical observations would be a benefit to all practitioners. In the experimental situation, a set of reference scales should be devised prior to commencement.

The proposed system of grading slit lamp observations is relatively simple. It relies upon the clinical judgement of the practitioner, thus utilising existing skills, and clearly defined end points. Grades provide an interval scale based upon the clinical perception of severity and the need for intervention. This is a version of systems already used in many experimental studies by individuals, universities and companies (for example FDA studies, Mandell (1987), Holden and co-workers at the Cornea and Contact Lens Research Unit, and the Hydron Research Centre, London). As noted previously, it is not permissible to perform addition and subtraction of values within interval scales (i.e alteration from grade 3 to 4 is not equivalent to a change from grade 1 to 2). This scale could be applied to other clinical findings.

The proposed grades are:

0 Normal
1 Slight or mild changes from normal, which are not clinically significant
2 Moderate changes, which may require clinical intervention
3 Severe changes, which usually require clinical intervention
4 Very severe changes, which require intervention, often medical

A potential disadvantage of this grading system relates to possible differences in clinical judgement between practitioners, which would influence application of these clinical scales. It is unlikely, however, that these intra-practitioner differences would be so significant as to render this grading system ineffective. The system has the advantage that practitioners make the types of clinical judgements implicit in the grading system with each patient, and thus its implementation is simple. Use of a grading system may increase practitioner awareness of the clinical findings. In the event of a negligence suit, case records with grades reported as clinical judgements might justify a patient management decision.

Expansion of the five grades by the use of fractions or decimals (e.g "grade 1.5") may enhance the information content. For the system to be useful to other practitioners it is suggested that records include the condition and the endpoint of the scale (e.g "microcysts 1.5/4"). Descriptive terms may be added to explain the decision for a particular grade and to add relevant information (e.g "all vessels looped and non-aggressive"). To complete the clinical case record a simple diagram indicating the location, depth and extent of the condition should be made (Figure 1). Case records in this format can then easily be interpreted for changes in condition, facilitating the clinical decision making.

An aspect of all scales is the difference between experimental, and clinical significance. For example, in a small trial, some individual results may be of great clinical significance, but statistical significance may not be shown. Conversely, in very large trials statistical significance may be demonstrated, without a clinically relevant result.

<table>
<thead>
<tr>
<th>Table 1</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Tears:</strong> blink completeness and rate, tear prism, condition, debris, mucoid layer, mucous strands, non-invasive break up time (NIBUT)</td>
</tr>
<tr>
<td><strong>Lids/Lashes:</strong> regularity, scale, oiliness, exudeate, patency of punctae, meibomian gland dysfunction, blepharitis</td>
</tr>
<tr>
<td><strong>Lids (internal):</strong> papillary changes, concretions, follicles, scarring, injection, hyperaemia, inflammatory conditions (cysts, hordeolum, chalazion etc)</td>
</tr>
<tr>
<td><strong>Limbal/Bulbar Conjunctiva:</strong> injection (ciliary, conjunctival, limbal), pterygium/pingueculae, pigmentation</td>
</tr>
<tr>
<td><strong>Cornea1 Epithelium:</strong> staining, microcysts, vacuoles, infiltrates, vessels, scars/irregularities</td>
</tr>
<tr>
<td><strong>Cornea1 Stroma:</strong> infiltrates, vessels, scars, striae, folds</td>
</tr>
<tr>
<td><strong>Cornea1 Endothelium:</strong> cell size, shape and density, surface appearance, guttata, blebs, pigment, exudeate (KP), bedewing</td>
</tr>
<tr>
<td><strong>Contact Lens fit:</strong> location, centration, corneal coverage, movement, alignment, edge clearance, tightness, comfort, over ophthalmometry</td>
</tr>
<tr>
<td><strong>Contact Lens condition:</strong> scratches, surface wetting, deposits</td>
</tr>
</tbody>
</table>
For slit lamp examination of contact lens patients the ideal may be a form which allows the practitioner simply to mark a box for each observation. This ensures compliance in an experimental trial and aids in completion of clinical procedures. In private practice this may not be feasible due to constraints upon time and space. Another option is the use of check list, accessibly placed, preferably near the slit lamp. Table 1 is an example of such a check list.

To summarise briefly, the grading system for slit lamp observations presented here is useful to the practitioner and the experimenter, and may form a basis for a recognised scale for clinical findings. The advantages of a grading system over qualitative recording include increased reliability, the avoidance of semantic ambiguity, and systematic data recording for ease of data analysis. Descriptions may be used to expand the information. For full information regarding an observed condition, diagrams indicating location, depth and extent are essential.

References
Brandreth R.H Clinical Slit Lamp Biomicroscopy Blaco, San Leandro, 1978
General Optical Council, Notice for the guidance of the Profession, Notice N.22, 1987
Larke J.R The Eye in Contact Lens Wear Butterworths, London, 1985
Miller G.A The magical number seven, plus or minus two: Some limits on our capacity for processing information, Psychol. Rev. 63(2) 81-97, 1956
Zantos S.G Corneal infiltrates, debris and microcysts, J. Am. Optom. Assoc. 55(3) 196-198, 1984