- Commercial manufacturing—Procurement of materials, design and use of facilities, utilities, and equipment, actual production of the product, final package and labeling, and QC and assurance (product release, storage, and distribution).
- Product discontinuation—How all documentation and samples are retained and continued product assessment.

The scope of this guideline encompasses pharmaceutical drug substances and drug products including biotechnology and biological products throughout the entire product lifecycle. It encompasses such things as outsourcing activities, specific management activities, and all the quality systems already described such as change control, periodic product quality evaluation, and all other quality data monitoring, trending, and responses based on trends.

Section 2 of the guideline emphasizes the importance of management responsibilities in all stages of the product lifecycle. Indeed, management responsibility is a key issue for the success of Q10. Management commitment, including resourcing, internal communication, review, and oversight of all activities is the main determinative of the level of quality of a company.

The major elements or pillars of the PQS applying at all stages include the following:

- Process performance and product quality monitoring system(s)
- Corrective action/preventative action (CAPA) system
- Change management system
- Management review.

A term called "enablers" is used to describe knowledge management and quality risk management, again applicable throughout the product lifecycle stages, that support PQS goals of achieving product realization, establishing and maintaining a state of control, and facilitating continual improvement. Table 26-6, adapted from ICH Q10, summarizes the application of these four specific quality elements for the four main components of the product lifecycle (development, technology transfer, manufacturing, and product discontinuation).

The effectiveness of the PQS can be confirmed during a GMP regulatory inspection at the manufacturing site. This was covered in some detail in chapter 25.

ICH Q10 is the companion document along with two other ICH quality guidelines—pharmaceutical development (Q8) and risk management (Q9). The main objectives of the PQS include the following:

1. To establish, implement, and maintain and set of processes that provides a product with the quality attributes to meet the needs of patients, health care professionals, regulatory authorities, and internal customers.
2. To establish and maintain a state of control using effective monitoring systems and test systems for process performance and product quality.
3. To facilitate continual improvement of the quality of the product and process that includes, for example, reduction of variability, allows for innovation, and enables appropriate enhancement of the marketed product.

Many companies prepare, follow, and upkeep Quality Manuals that are typically huge master documents describing such items as the company quality policy, the scope of the quality system, management responsibilities within the quality system, and identification of all processes within the PQS, especially detailing how all these processes link together and are interdependent.

It is outside the scope of this chapter to provide more information on Quality Manuals, quality policies, management responsibilities, and other components of a Total Quality System, but there are plenty of references available that do provide such detail. Table 26-7 provides an organized listing of ICH Quality Guidelines (3).

QUALITY RISK ASSESSMENTS

Risk management and assessments have been broadly and specifically applied in pharmaceutical manufacturing, be it any type of dosage form or device or the active pharmaceutical ingredient. Basically risk management enables the identification of critical areas or product/process vulnerabilities. It is a systematic process for the assessment, control, communication, and review